

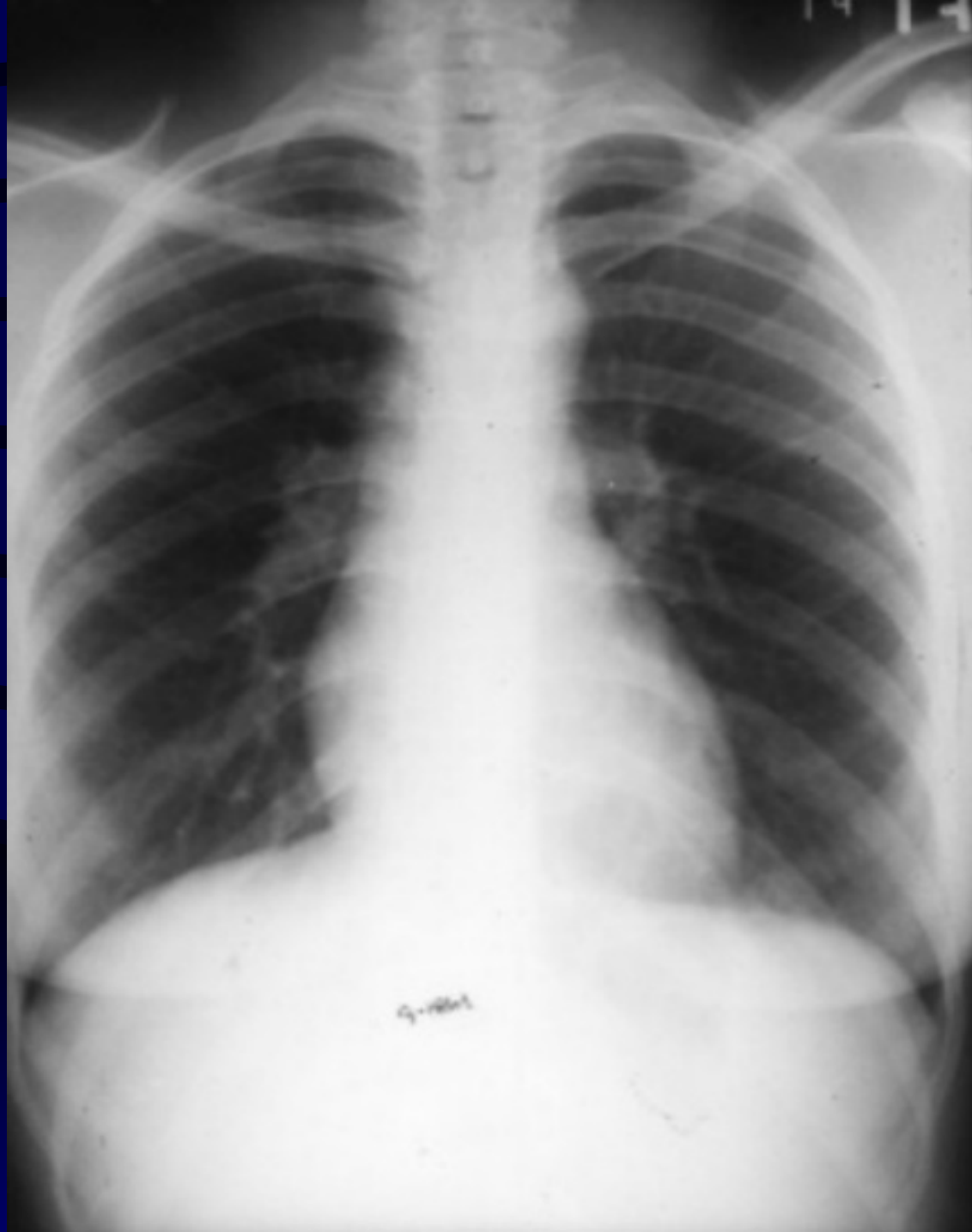
FUNDAMENTALS of THORACIC IMAGING

DAVID S. FEIGIN, M.D.

Colonel, MC, USA

Department of Radiology

Uniformed Services University





9-1861

SN 1117.7

Im:15 +C

MAY 10, 2000

512

DFOV 32.0cm

LUNG

R
1
7
2

L
1
4
8

R

L

kV 120

mA 280



SN I117.7

Im:15 +C

MAY 10, 2000

512

DFOV 32.0cm

STND

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kV 120

mA 280



Stu: 00362
Ser: 003/08
Ima: 004/014

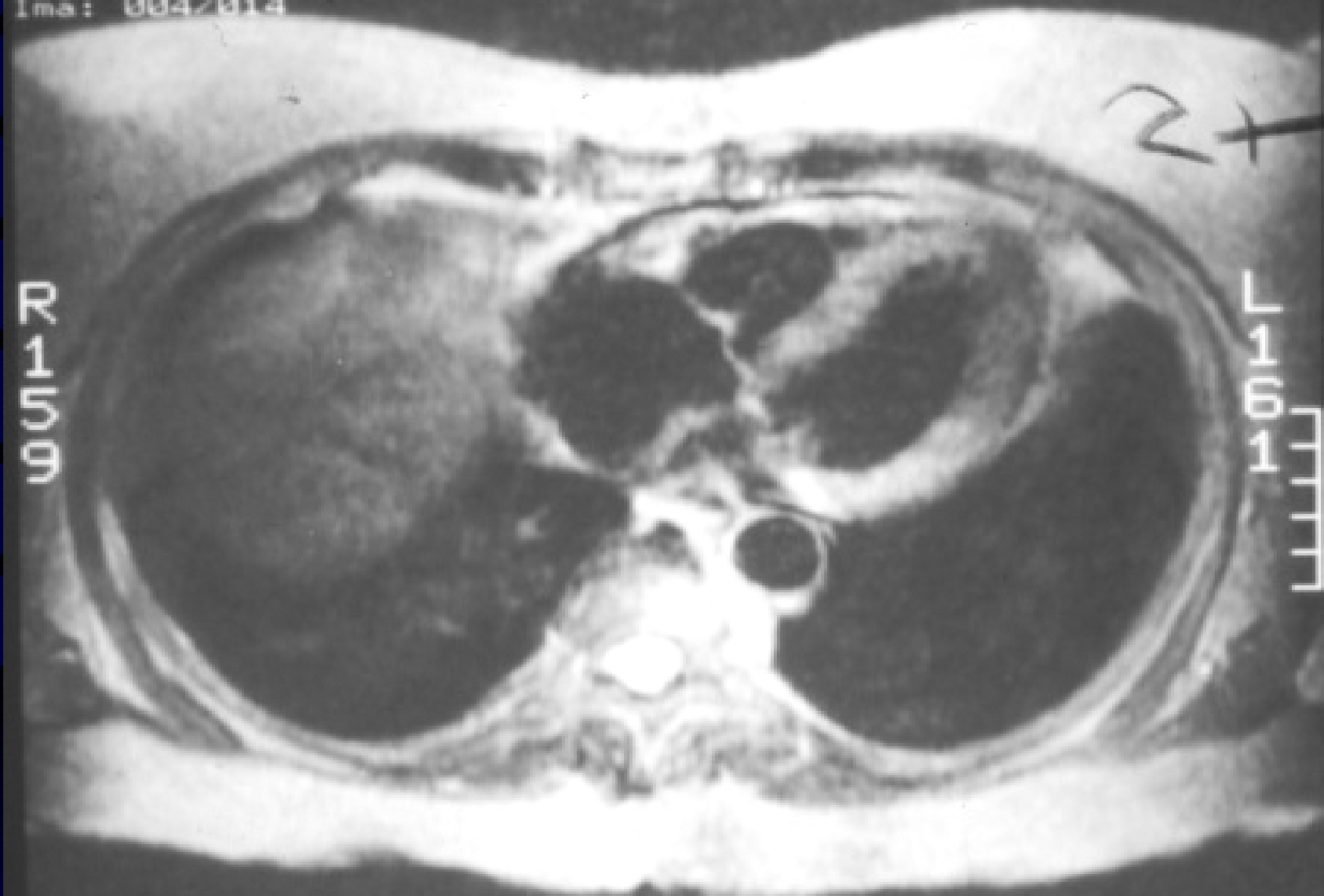
A138

9051 R

L 161

2+

P182

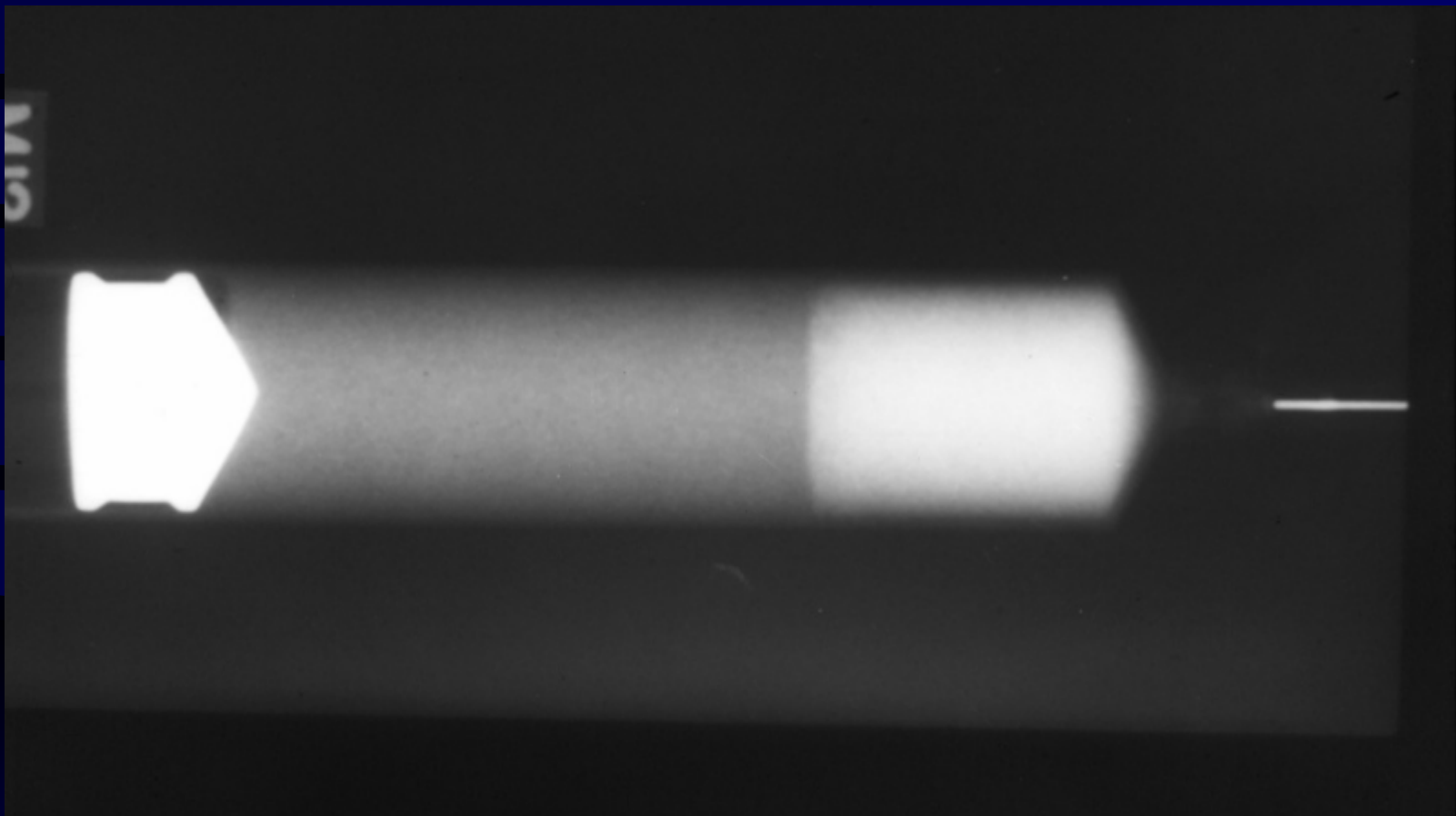


Terms Frequently Used and Misused

- DENSITY - Whiteness, or any area of whiteness, on an image
- LUCENCY - Blackness, or any area of blackness, on an image
- SHADOW - Anything visible on an image; hence, any specific density or lucency
- EDGE - Any visible demarcation between a density on one side and lucency on the other

Terms Frequently Used and Misused cont.

- LINE - A thin density with lucency on both sides or a thin lucency with density on both sides
- STRIPE - Either edge or line
- SILHOUETTE - Synonym for edge; the loss of an edge constitutes the “silhouette sign”



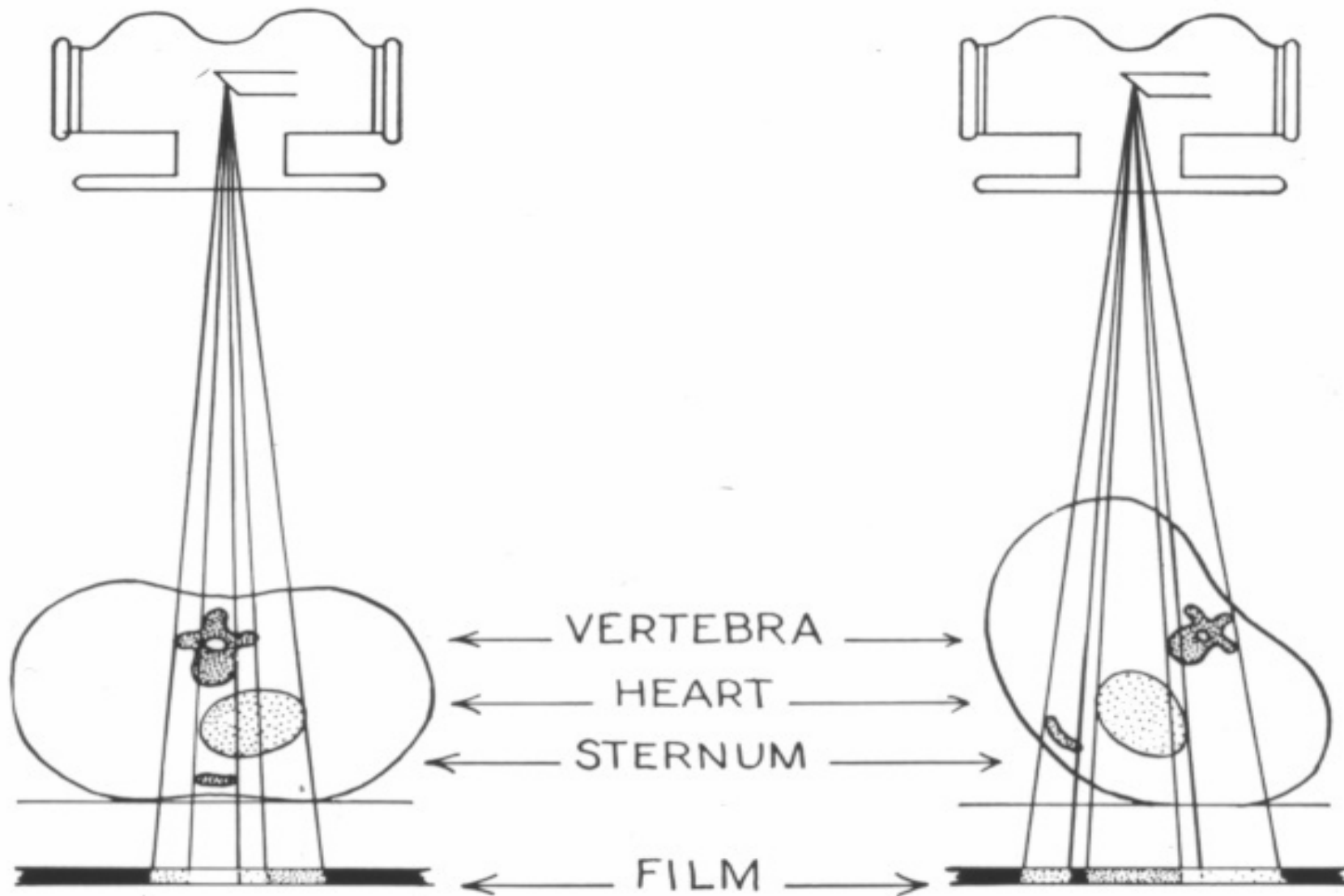
M19

“The Rules of Visibility”

- “Rule number 1” - The edge of any structure is only visible if it is bordered by a structure of different fundamental density

“The Rules of Visibility” #1 cont.

- On a chest radiograph, the only fundamental densities are air, soft tissues (including fat and blood) and calcium.
- Rule number 1 is not altered by patient position, direction of x-ray beam, or by technique



SUPERIMPOSITION OF
STRUCTURES LYING
ONE ABOVE THE
OTHER

OVERCOME BY PROJECTING
AWAY SUPERIMPOSED PARTS
BY ROTATION OF BODY (OR
TILTING OF TUBE)



“The Rules of Visibility” cont.

- “Rule number 2” - The lightness and darkness of any part of the image is the result of all structures through which the x-ray beam has passed

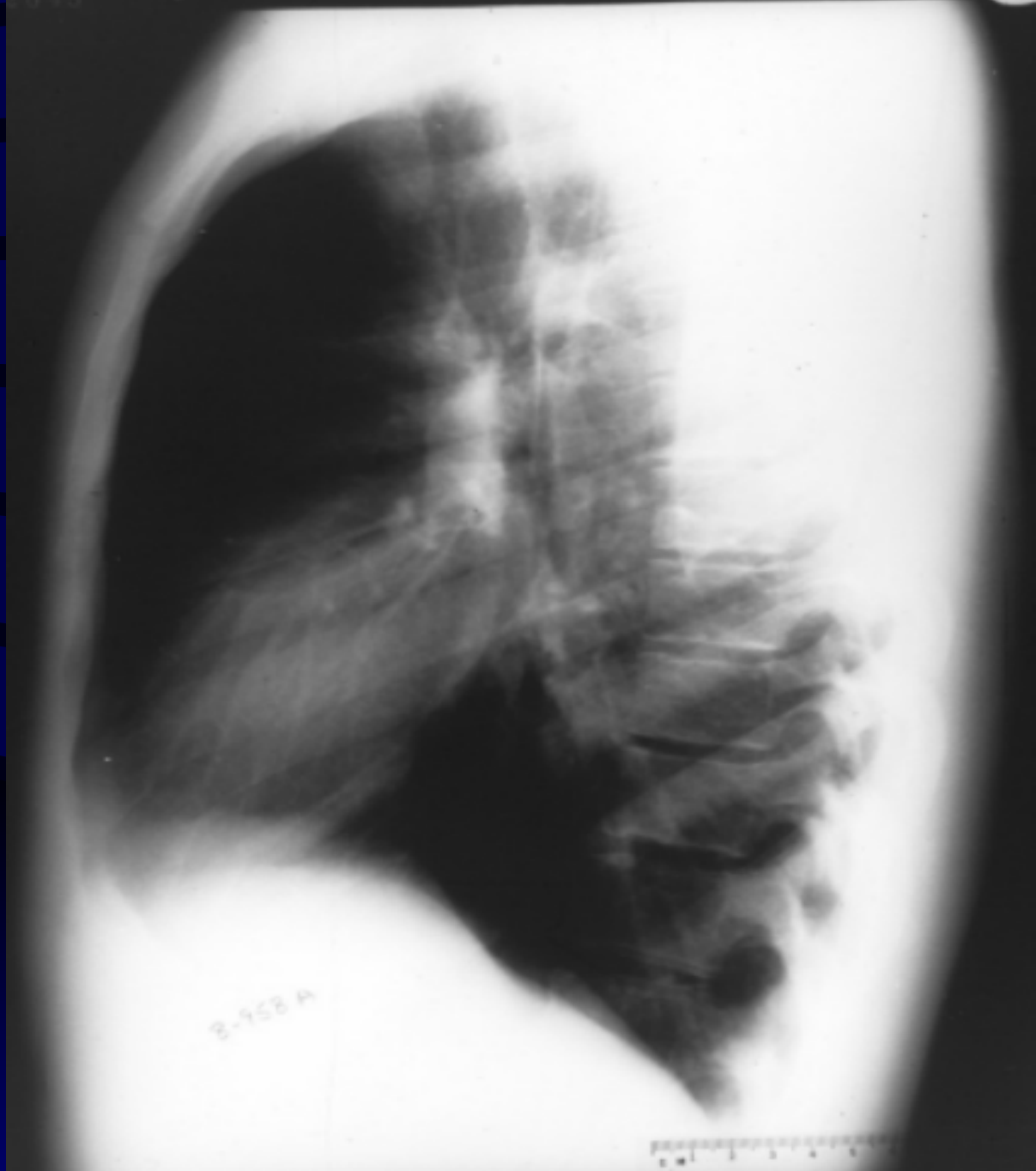


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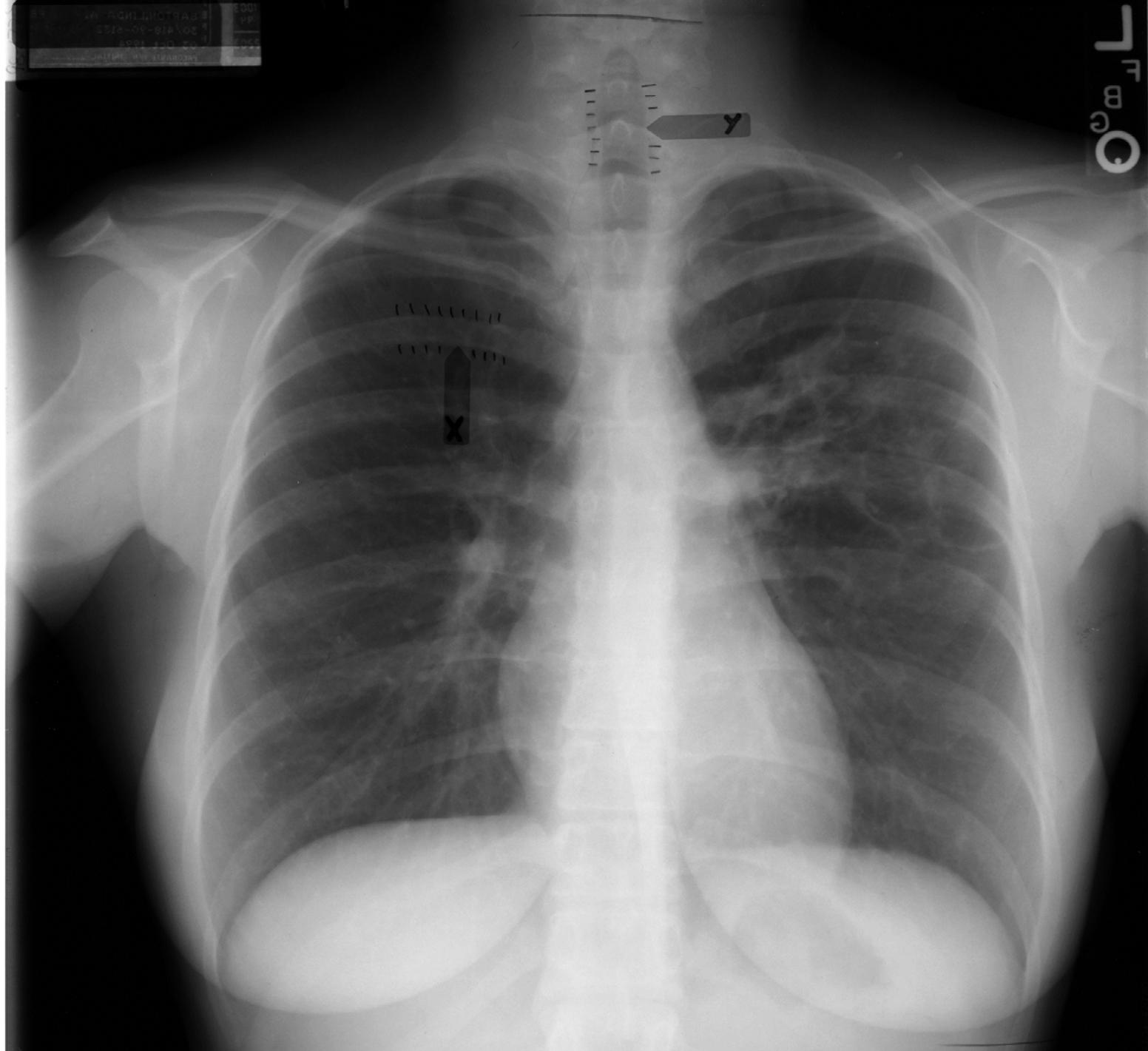
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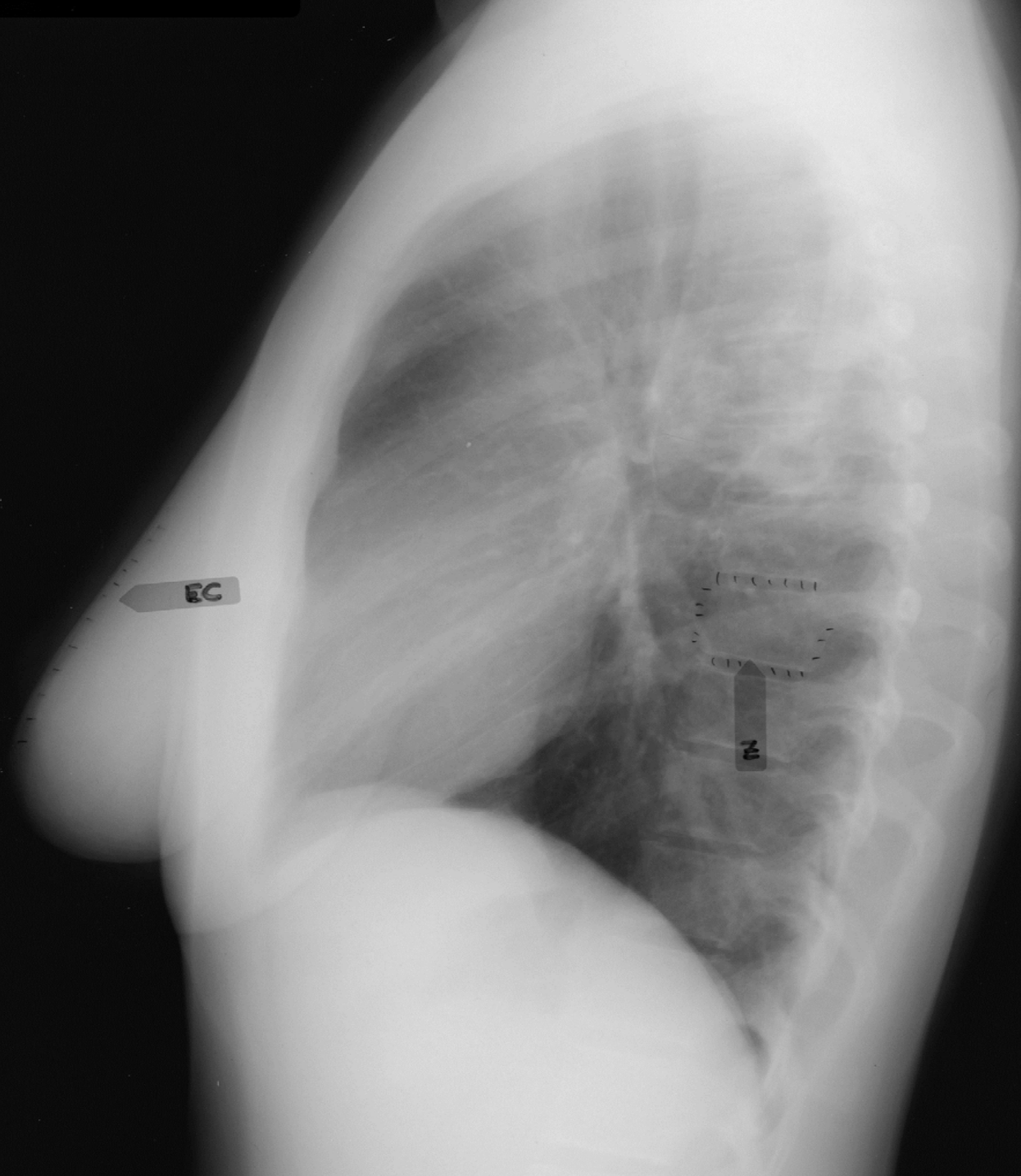
038



2-458 A







“The Rules of Visibility” #2 cont.

- Lightness and darkness are easily changed by technique, but the whole film will be similarly affected

THE NORMAL LUNG

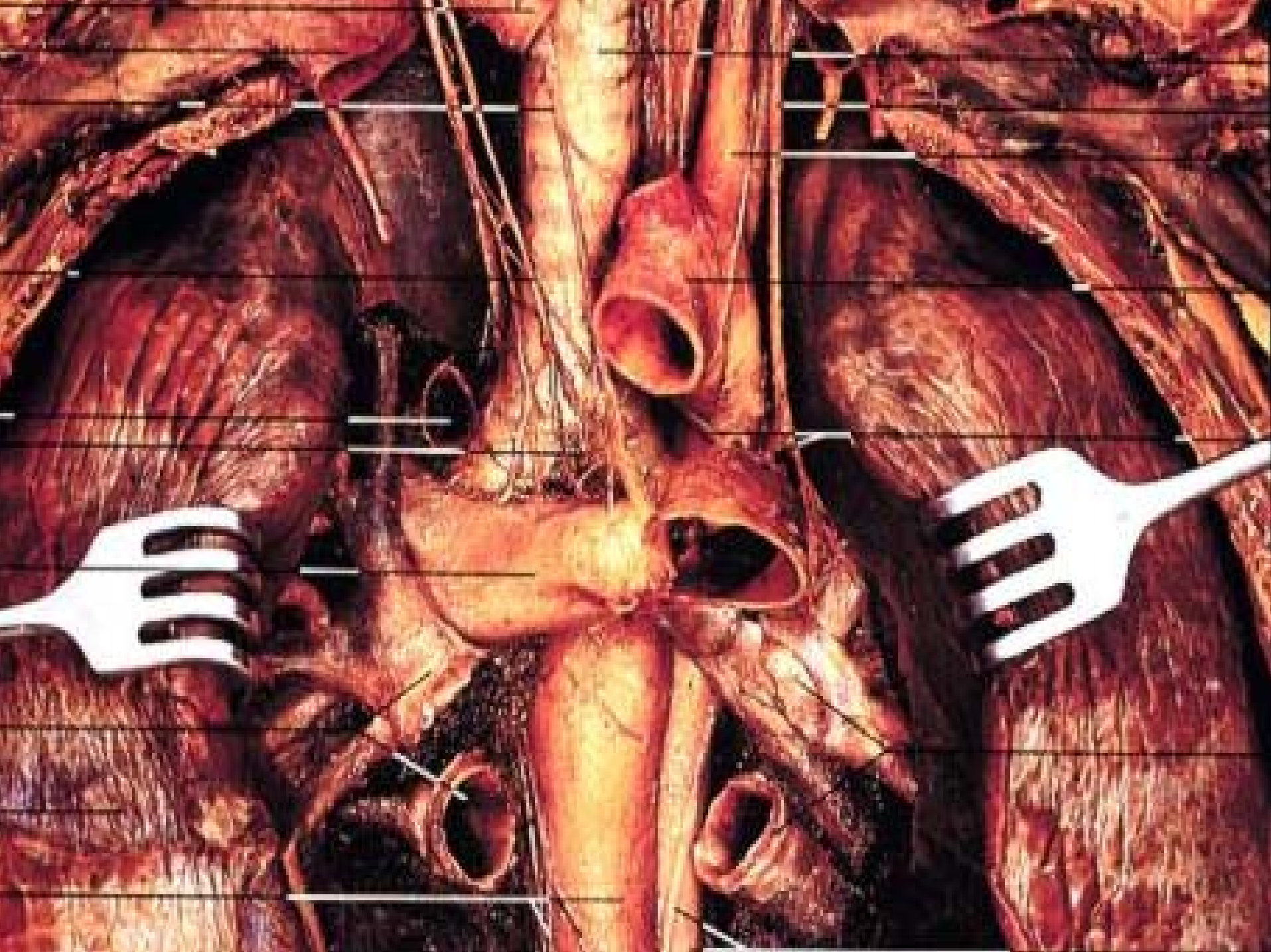
- The Hilum
 - The hilum is the anatomic connection of the lung to mediastinum and therefore consists of a variety of vessels, bronchi, and lymph nodes
 - The visible portion of each normal hilum is the right or left pulmonary artery
 - The pulmonary veins are inferior and posterior to the arteries





Normal lung cont.

- The pulmonary veins are inferior and posterior to the pulmonary arteries
 - Located behind the edges of the heart on the frontal view
 - Overlapping many other structures on the lateral view
 - The major bronchi are visible as lucencies
 - The lymph nodes are too small to be visible when normal





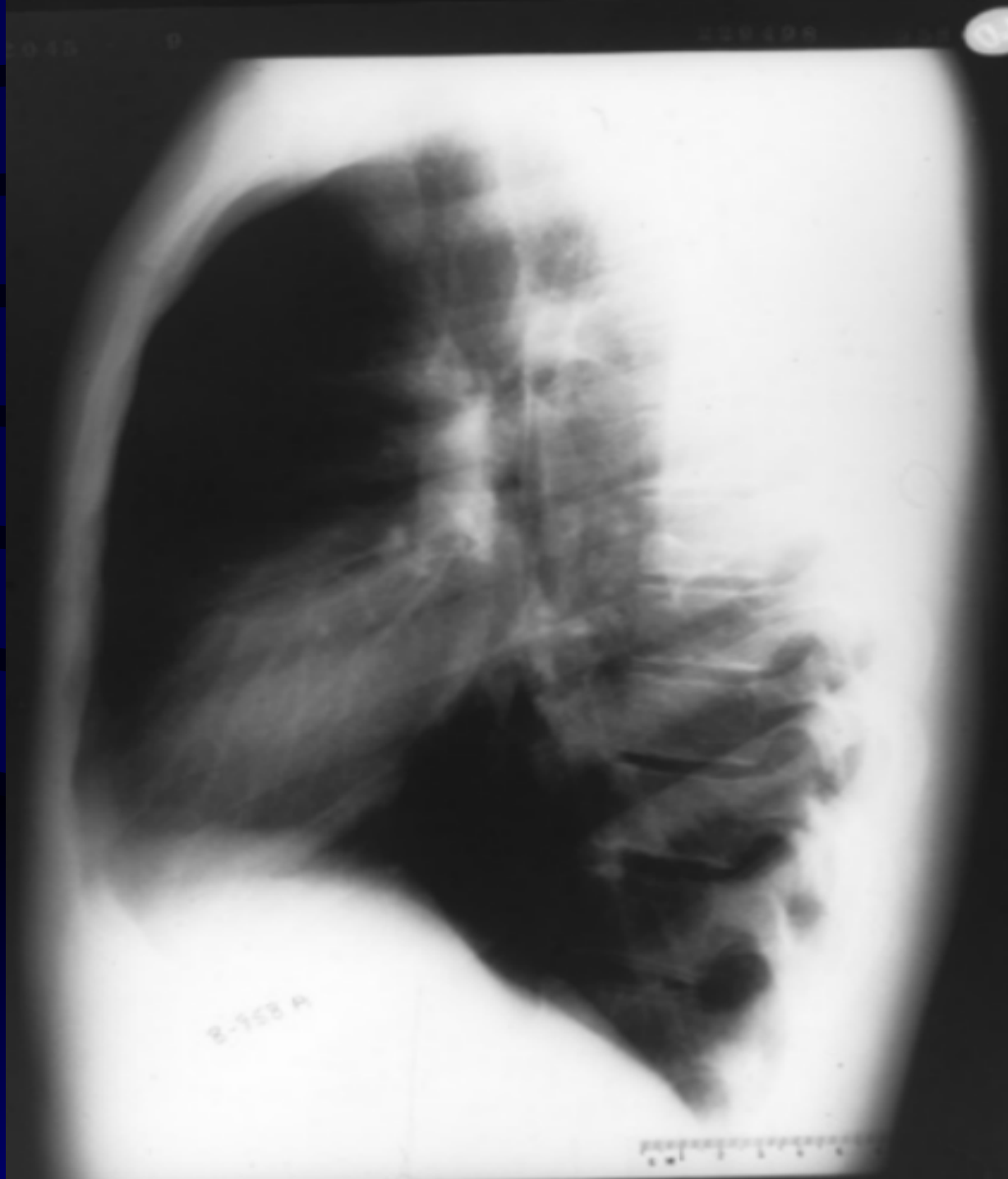
Q-958 D





Normal Lung cont.

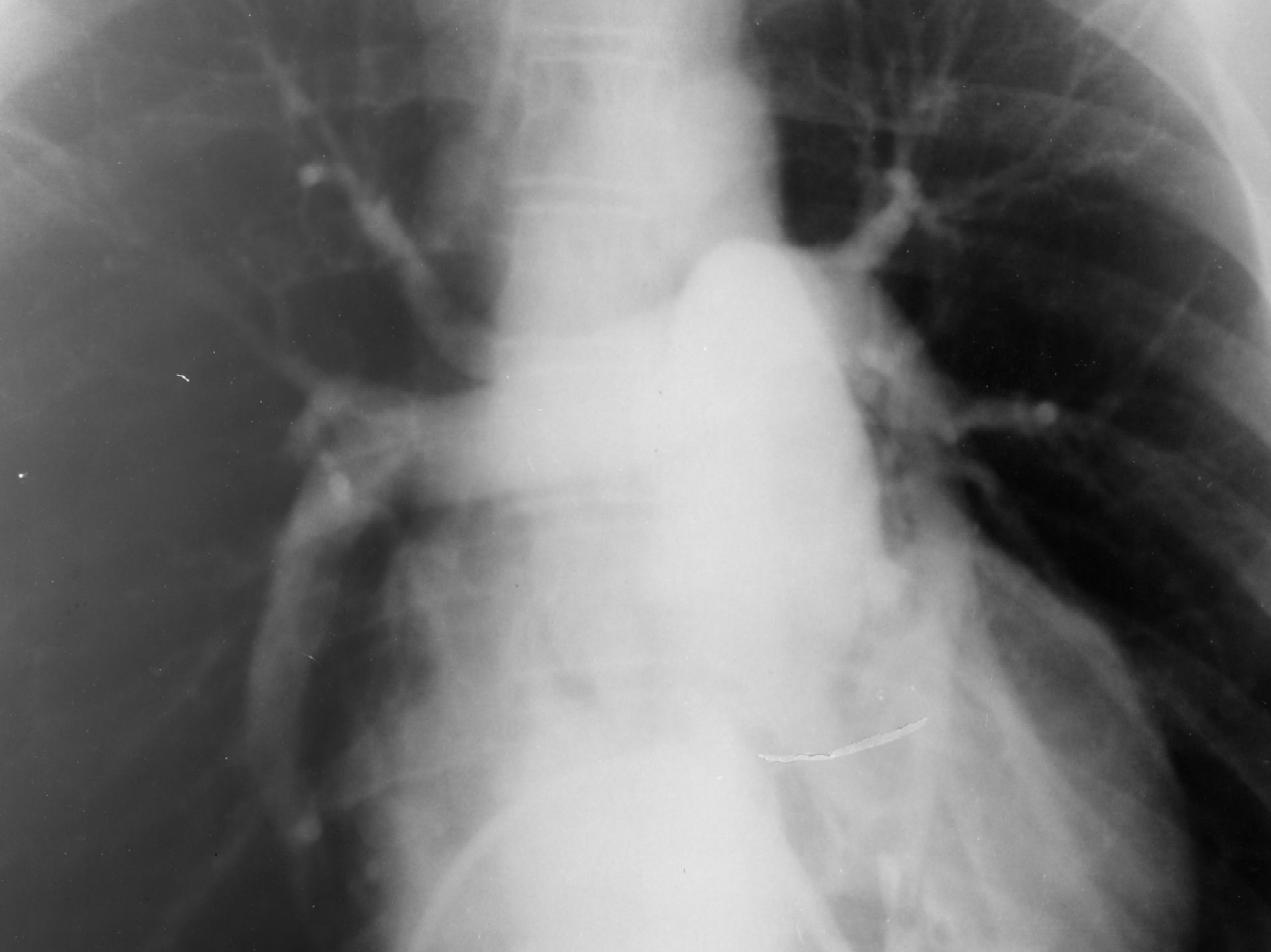
- The right and left pulmonary arteries are clearly visible on the lateral view, in the center of the image
- The right pulmonary artery is just anterior to the air column (trachea continuous with main bronchi) and left pulmonary artery is just posterior







9-770





NORMAL LUNG MARKINGS

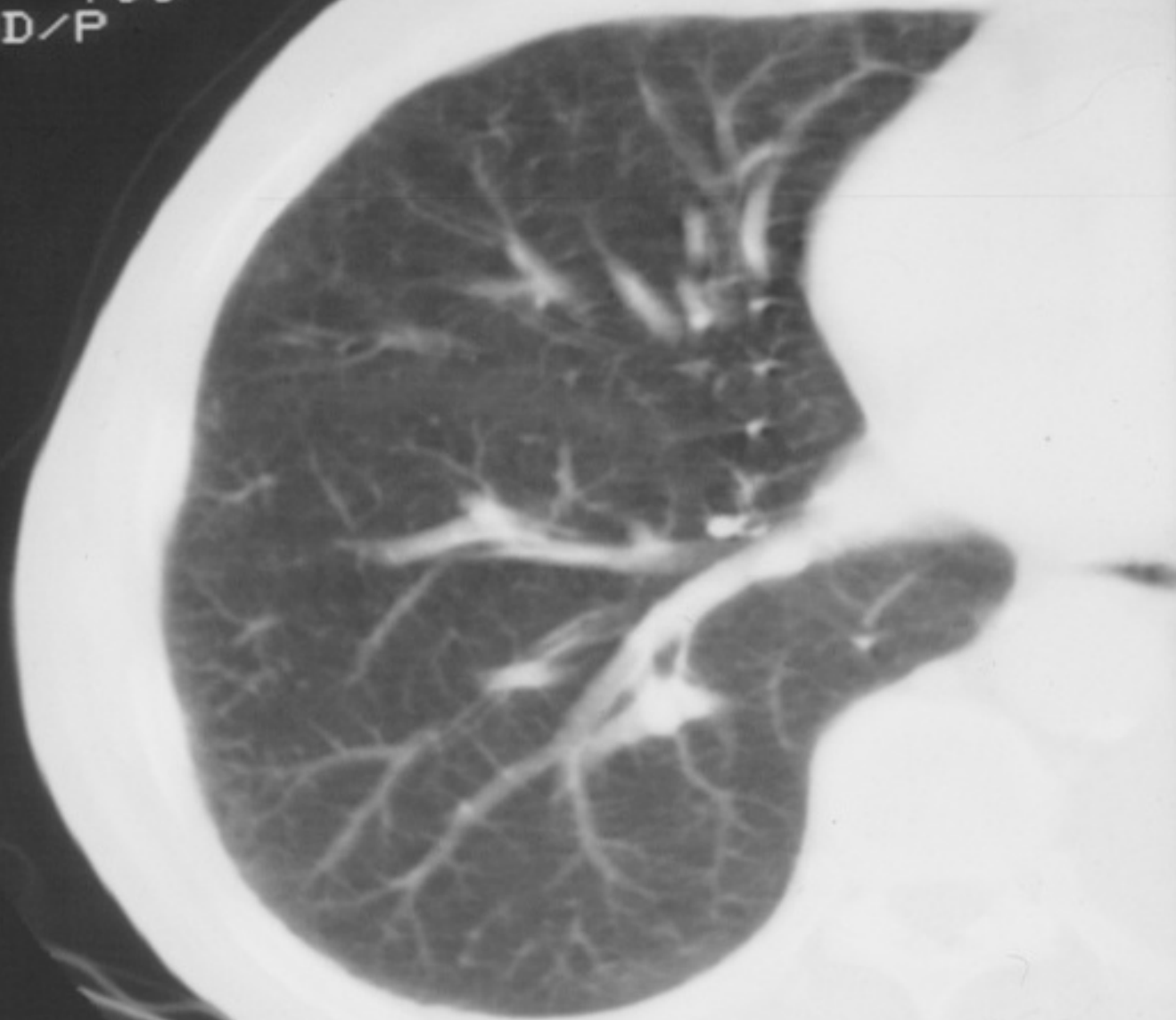
- The only normal densities within the lungs are the pulmonary vessels when filled with blood
- The normal markings (vessels) can always be followed from the hilum toward the lung periphery in all directions
- They branch at acute angles, taper and diverge toward the periphery



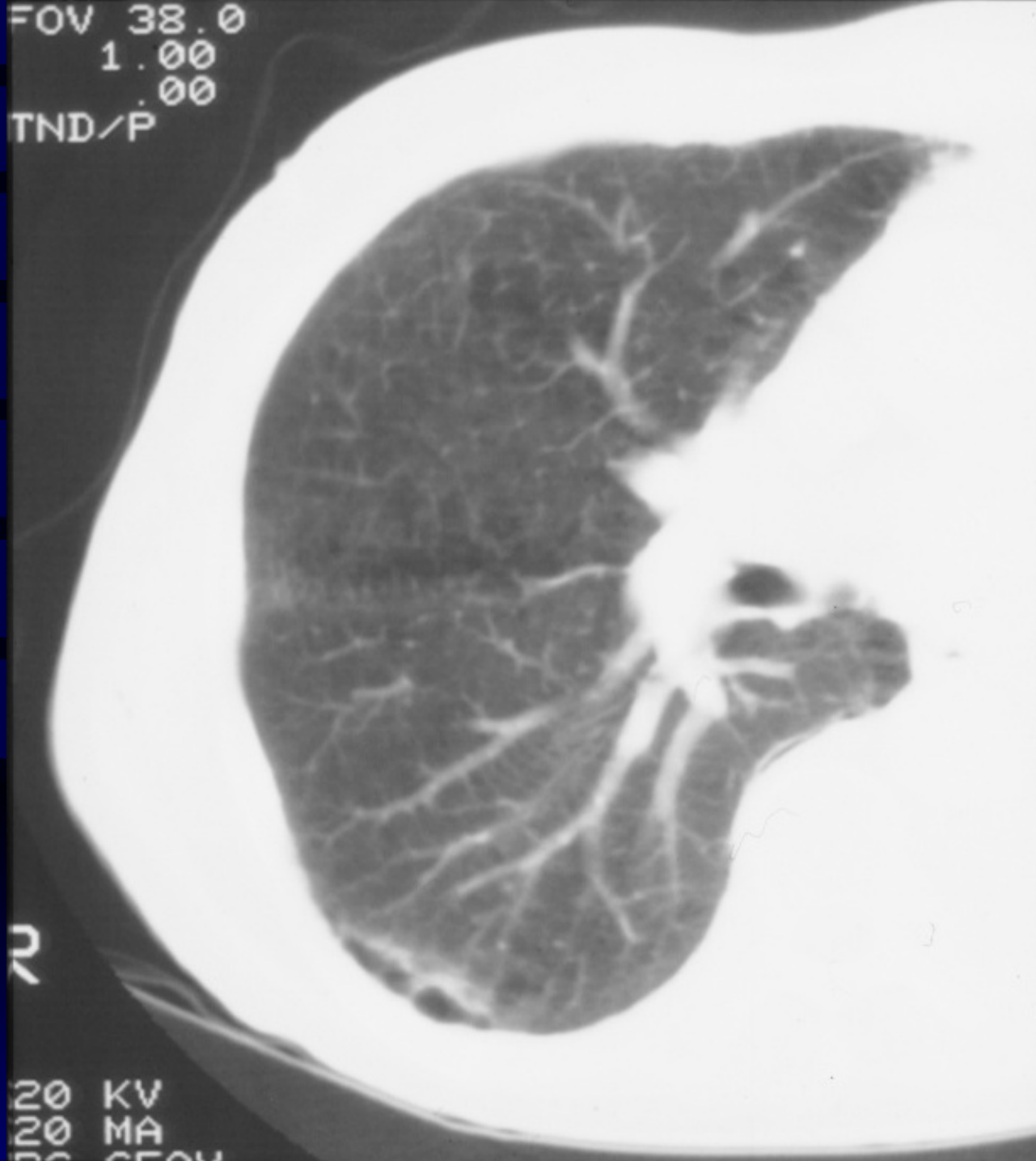


OV 38.0
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ND/P

Ø KV



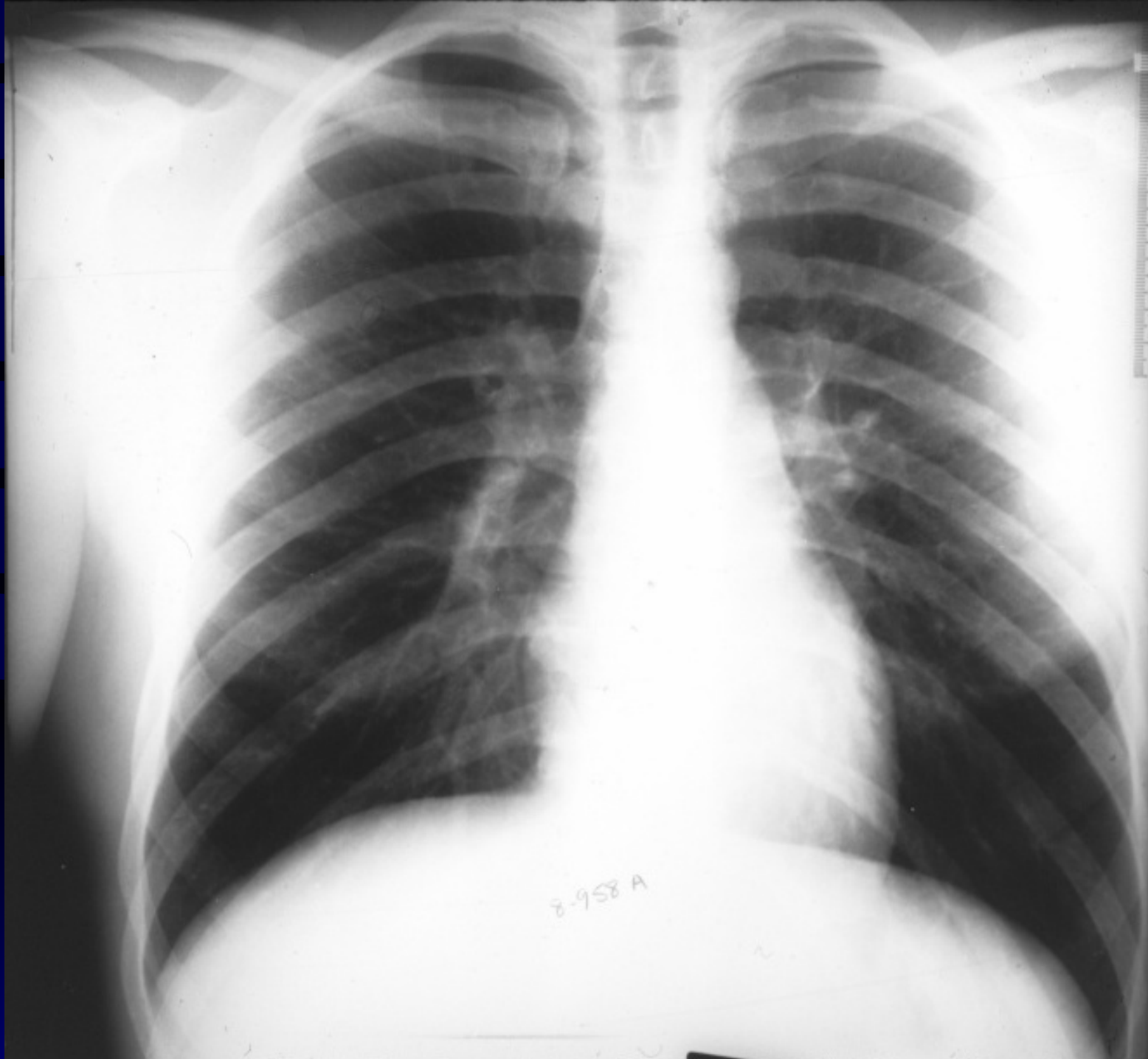
FOV 38.0
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20 KV
20 MA
2000

Normal Lung markings cont.

- Markings on end appear as small masses or nodules
 - They are recognized as normal vessels by the fact that they are superimposed upon vessels of the same diameter branching in other directions
- Abnormal pulmonary markings are all shadows in addition to the normal markings
 - Many such shadows obscure the normal markings or displace them





Normal Lung markings cont.

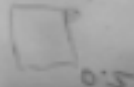
- Markings on end appear as small masses or nodules
 - They are recognized as normal vessels by the fact that they are superimposed upon vessels of the same diameter branching in other directions
- Abnormal pulmonary markings are all shadows in addition to the normal markings
 - Many such shadows obscure the normal markings or displace them

8-959 A



76P85

8-959A

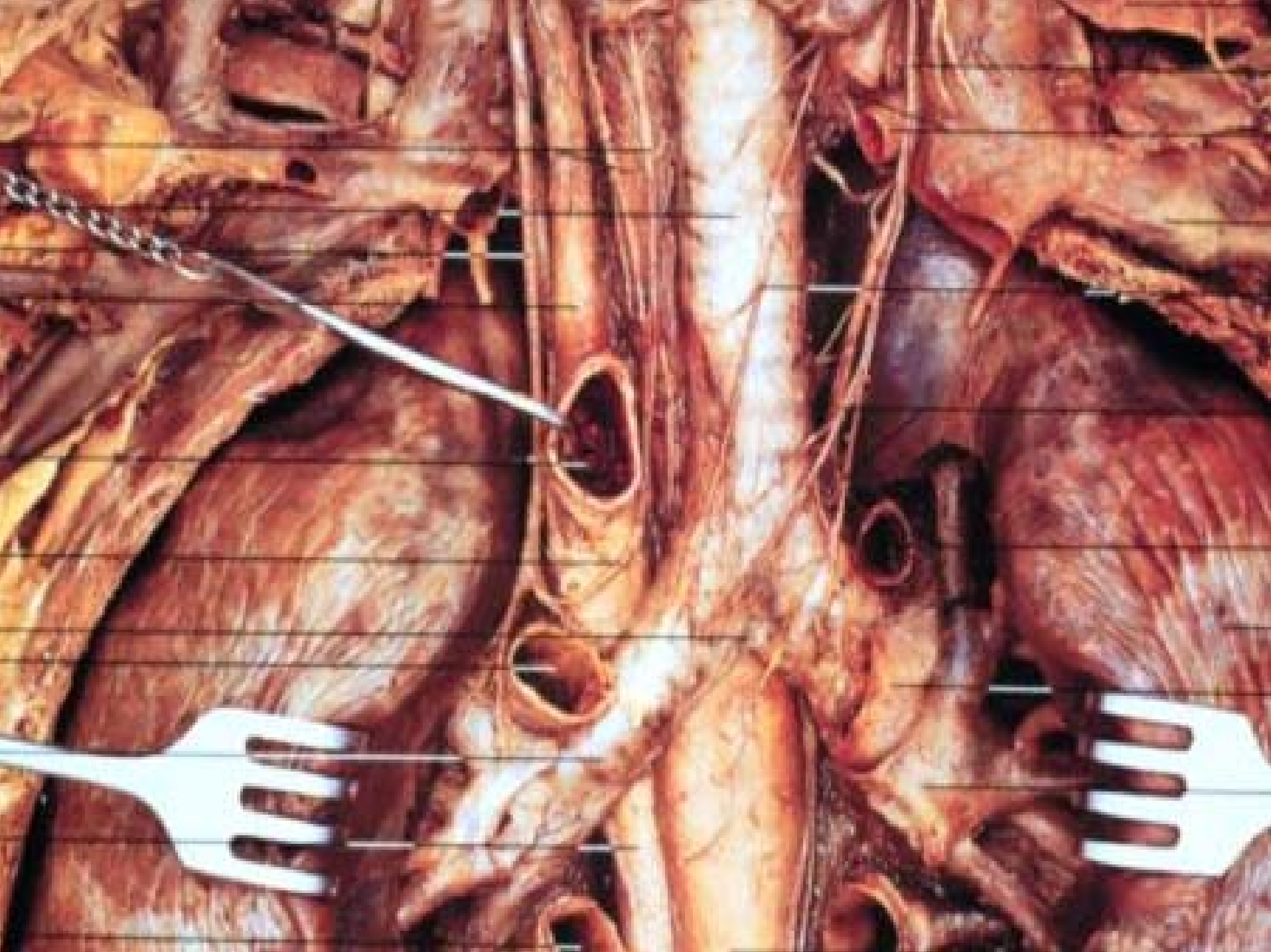


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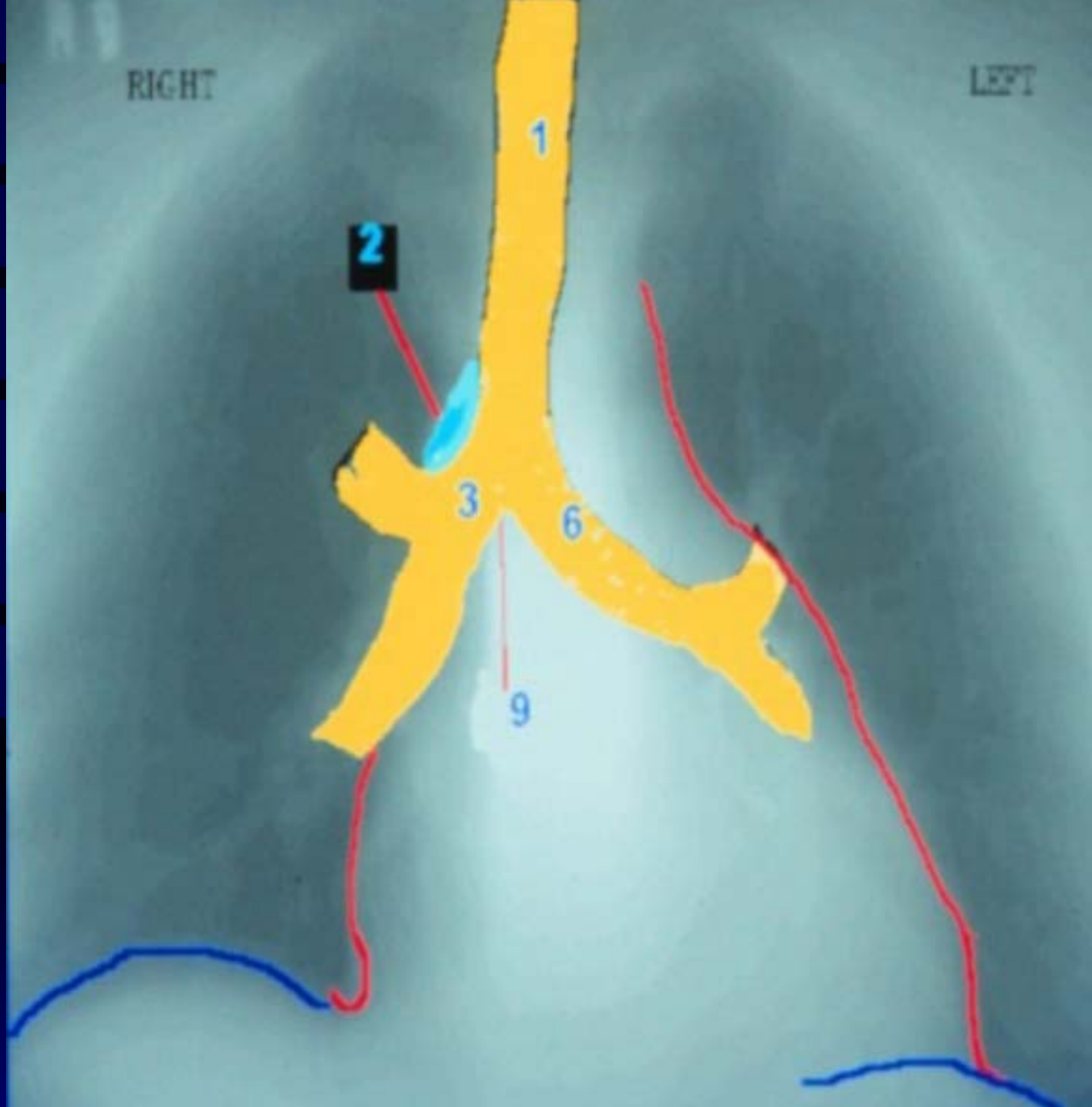
The AIRWAY

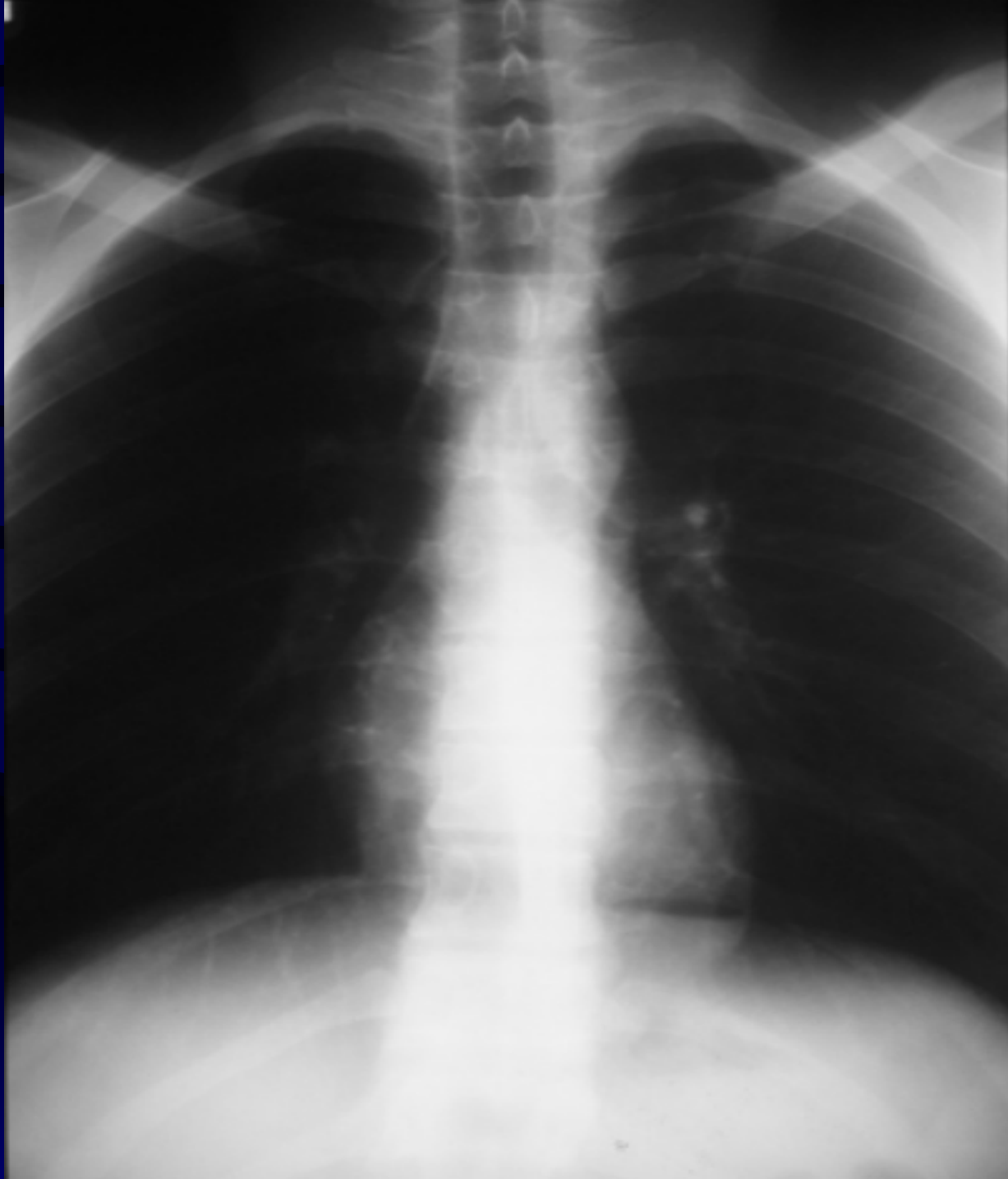
- The trachea is visible on both frontal and lateral views because it satisfies Rule #1
- The main bronchi are visible within the mediastinum and the medial portion of the hilum
- Once a bronchus is surrounded by air-filled alveoli, it becomes invisible because nearly all normal bronchial walls are too thin to be visible lines

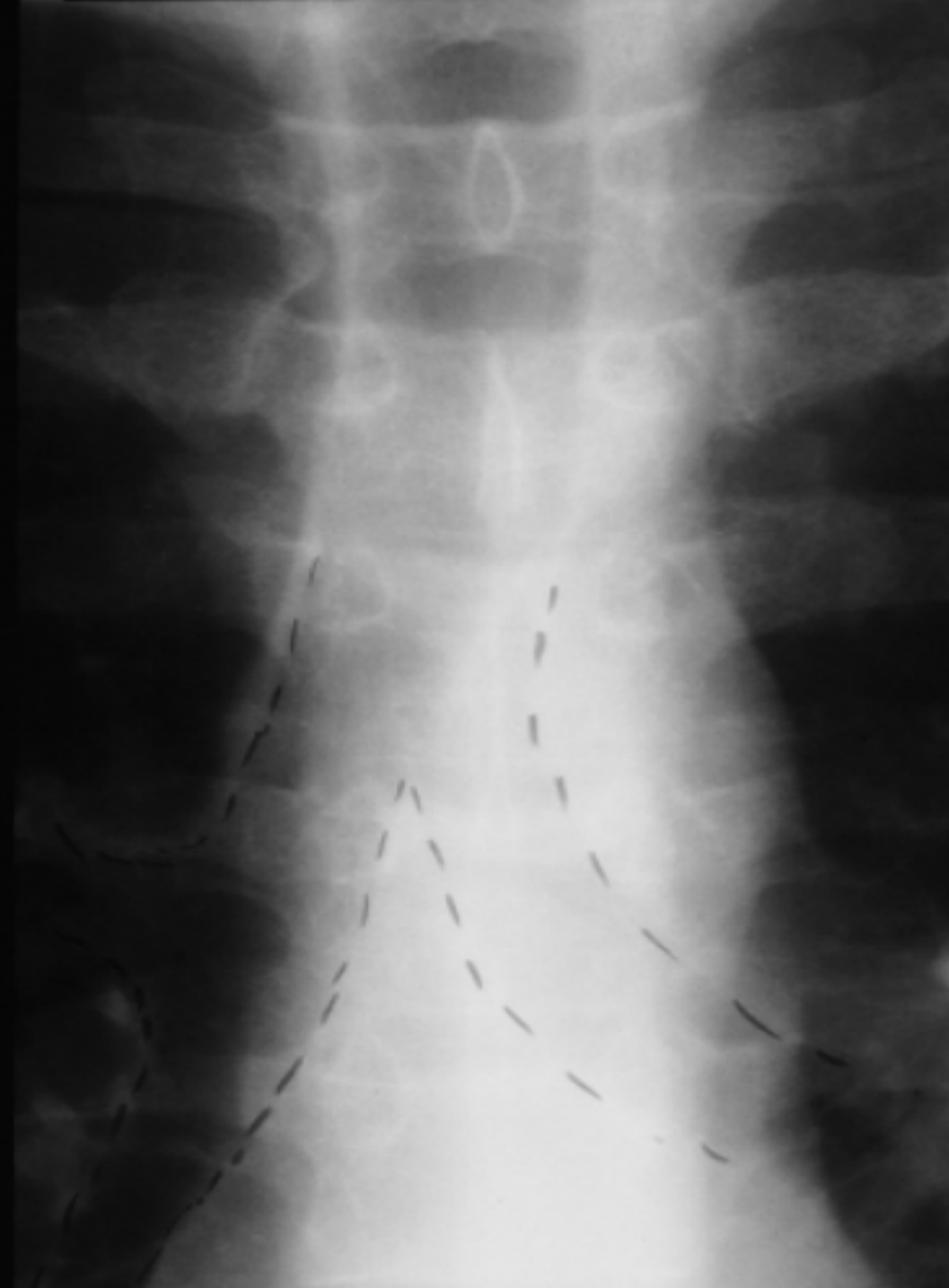


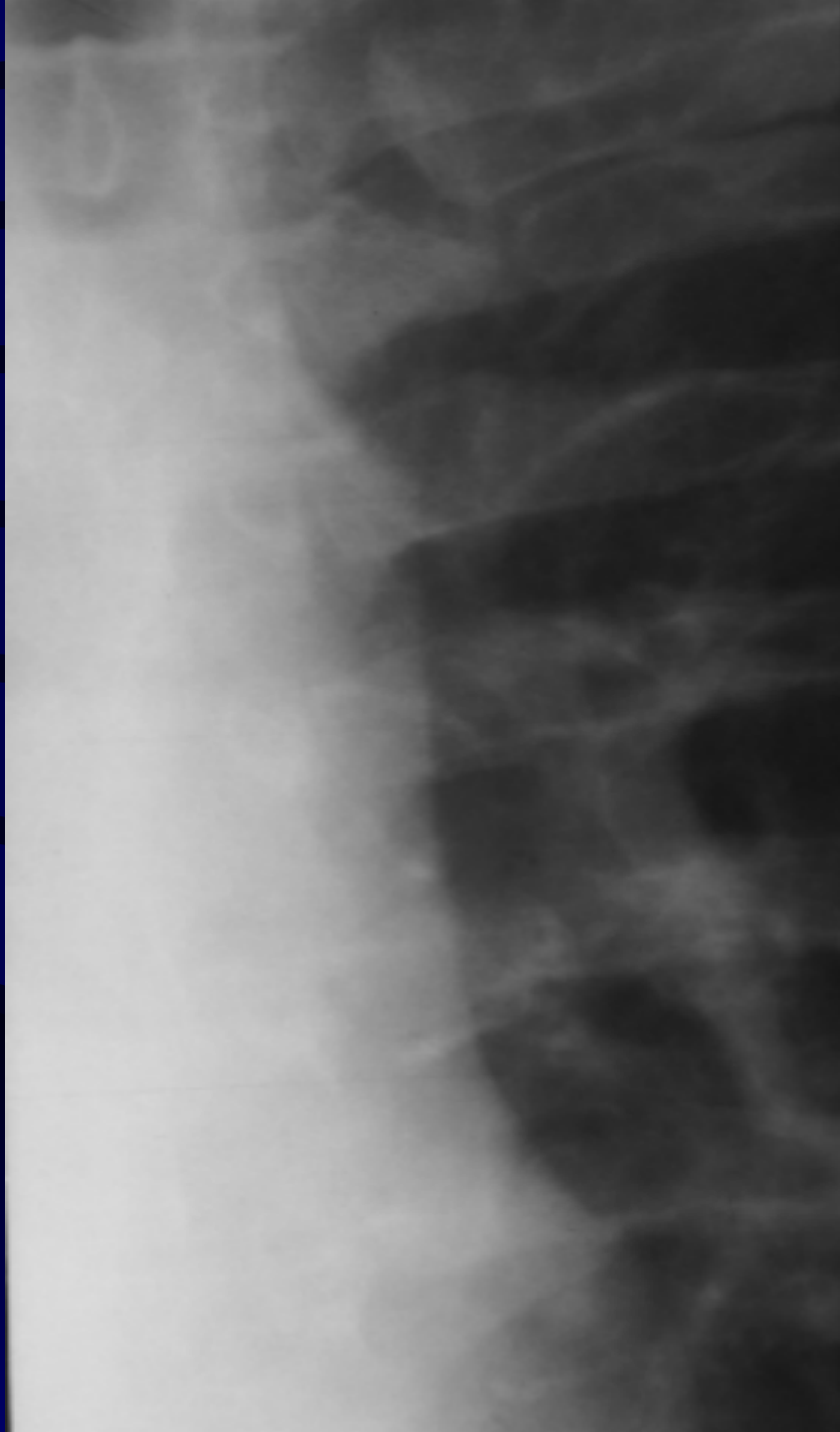
RIGHT

LEFT

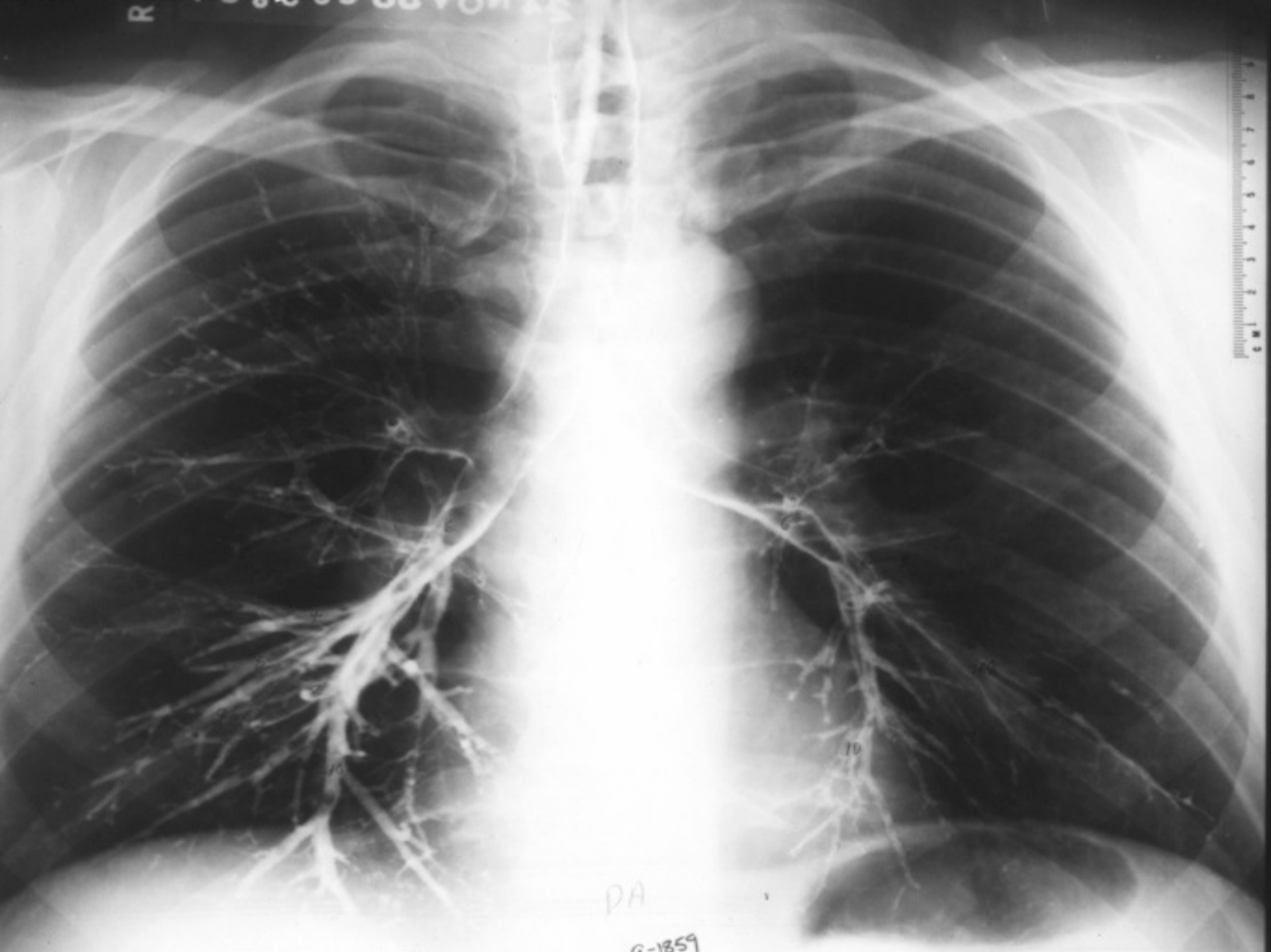


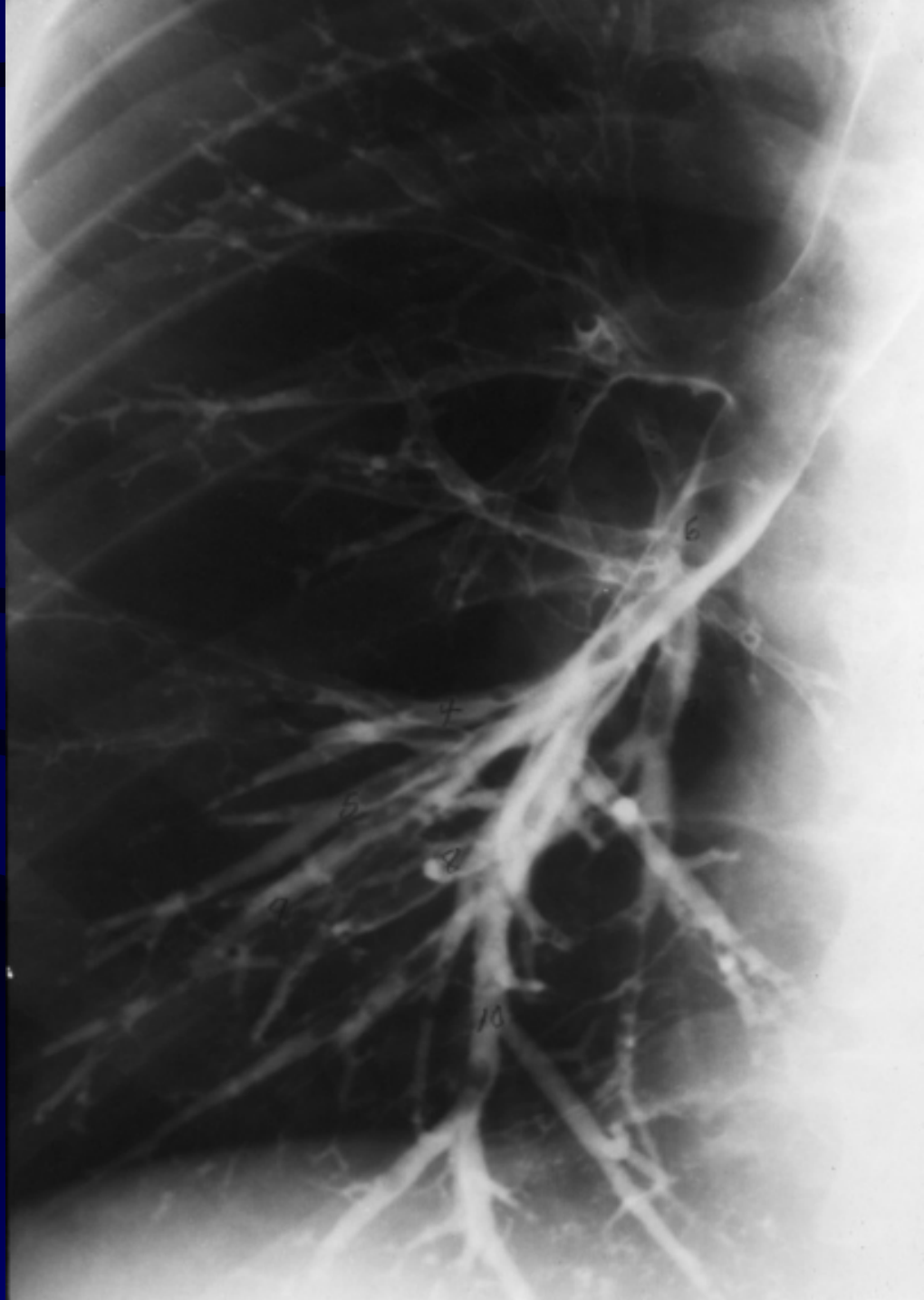






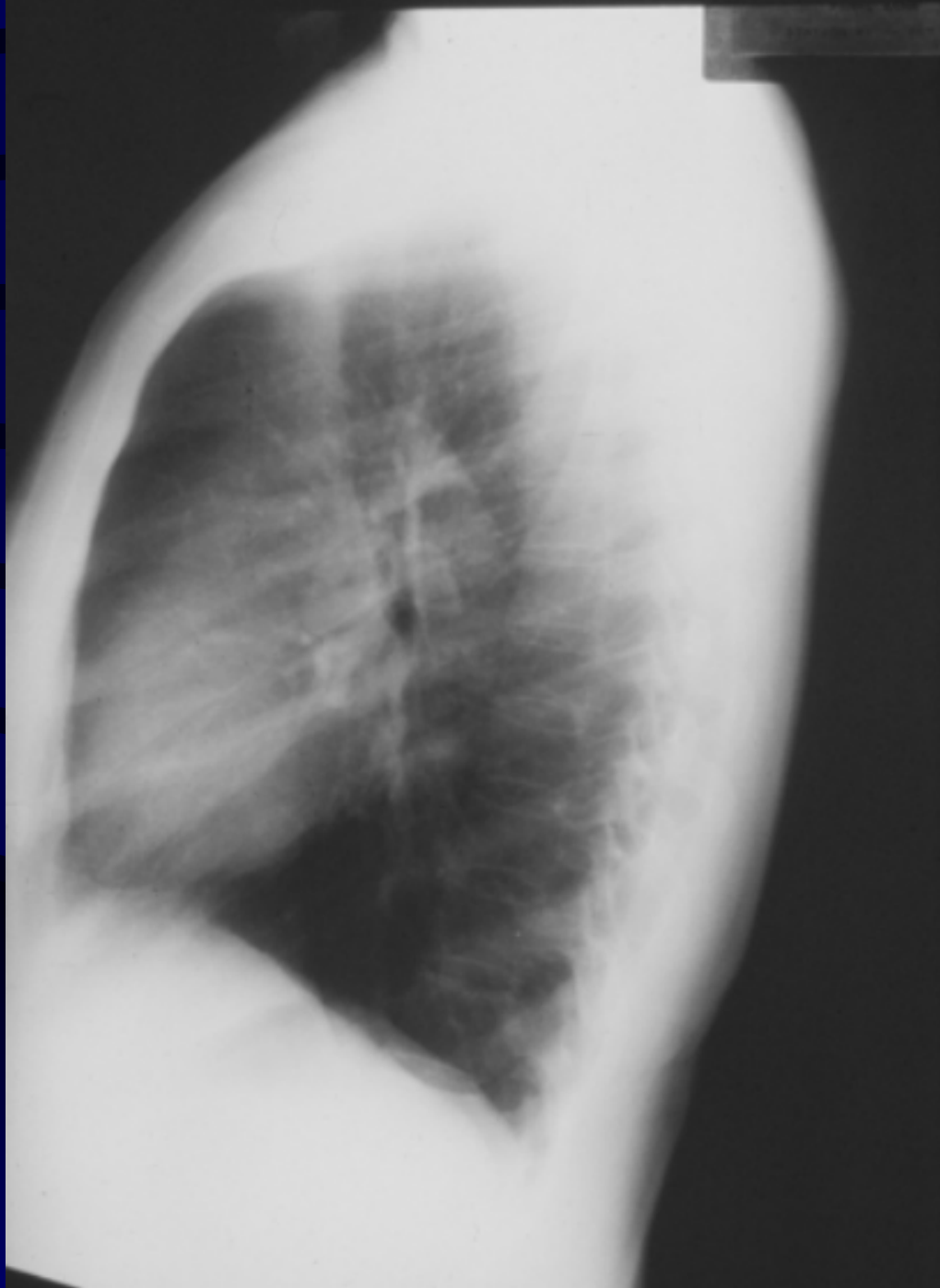






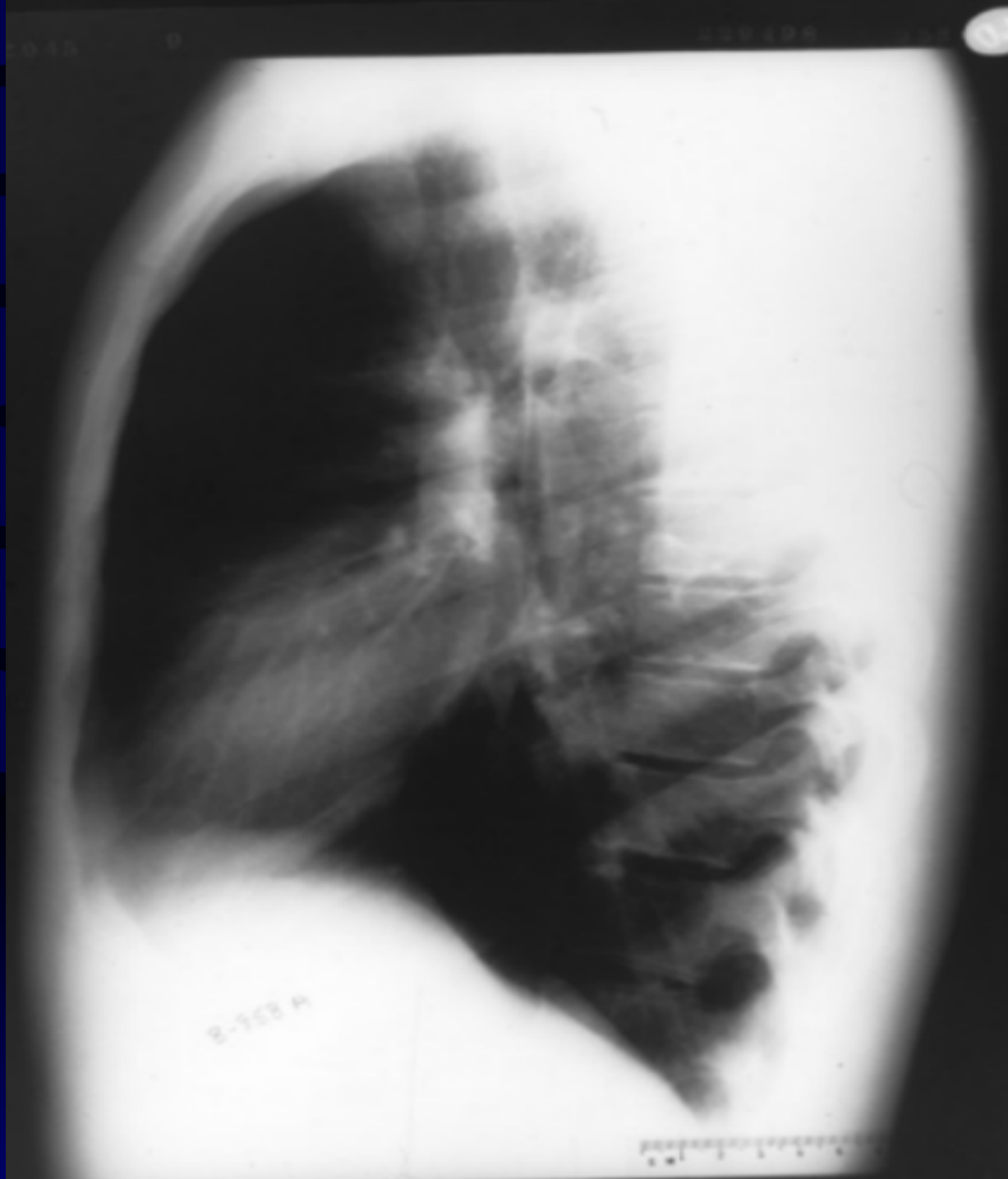
Demystifying the Lateral View

- The air column, which includes the trachea and largest bronchi, is visible because it satisfies Rule Number 1
 - The carina is not visible on the lateral view because the main bronchi continue in the same direction as the trachea
 - The round lucency in the center of the lateral view is the distal portion of the left main bronchus as it becomes horizontal



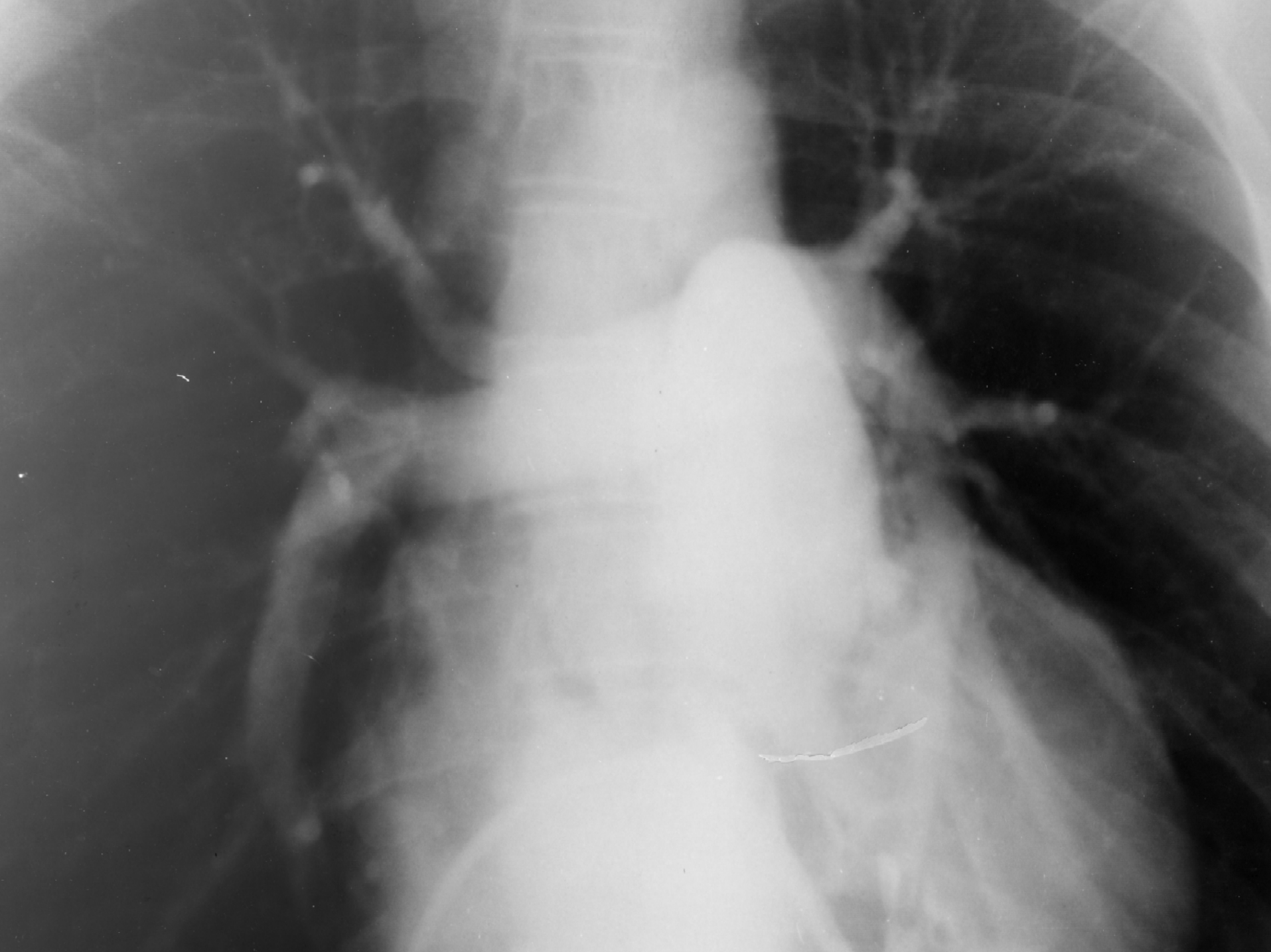
Demystifying lateral view cont.

- The lateral view of the hila surrounds the left bronchial lucency
- The heart shadow
 - The only margin of the heart that is visible as a distinct edge is the back of the left ventricle, which satisfies Rule #1 by bordering the left lower lobe of the lung
 - The top of the heart shadow is never a distinct edge because the pulmonary artery and aorta, rather than lung, are directly above the heart







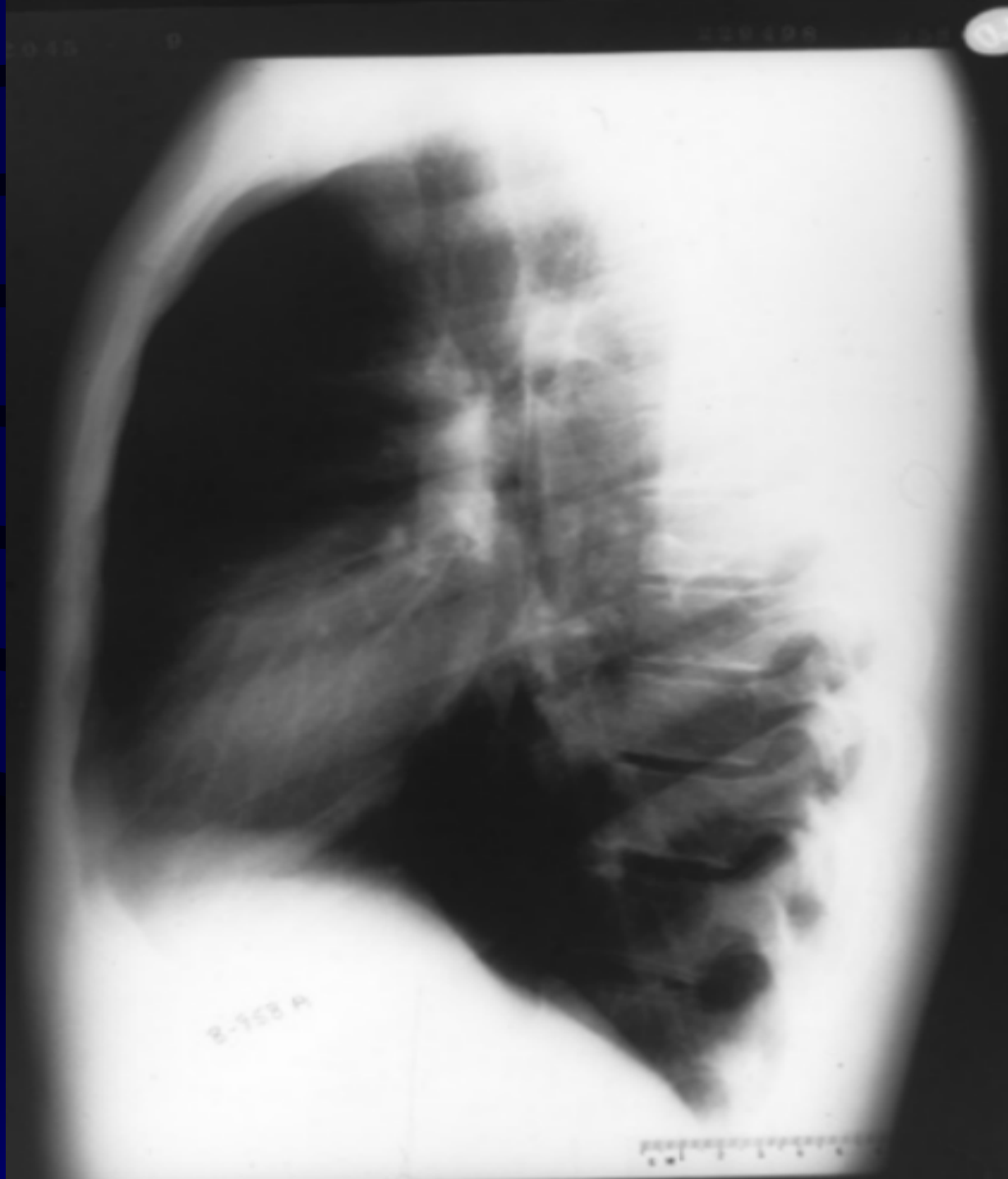




9-770

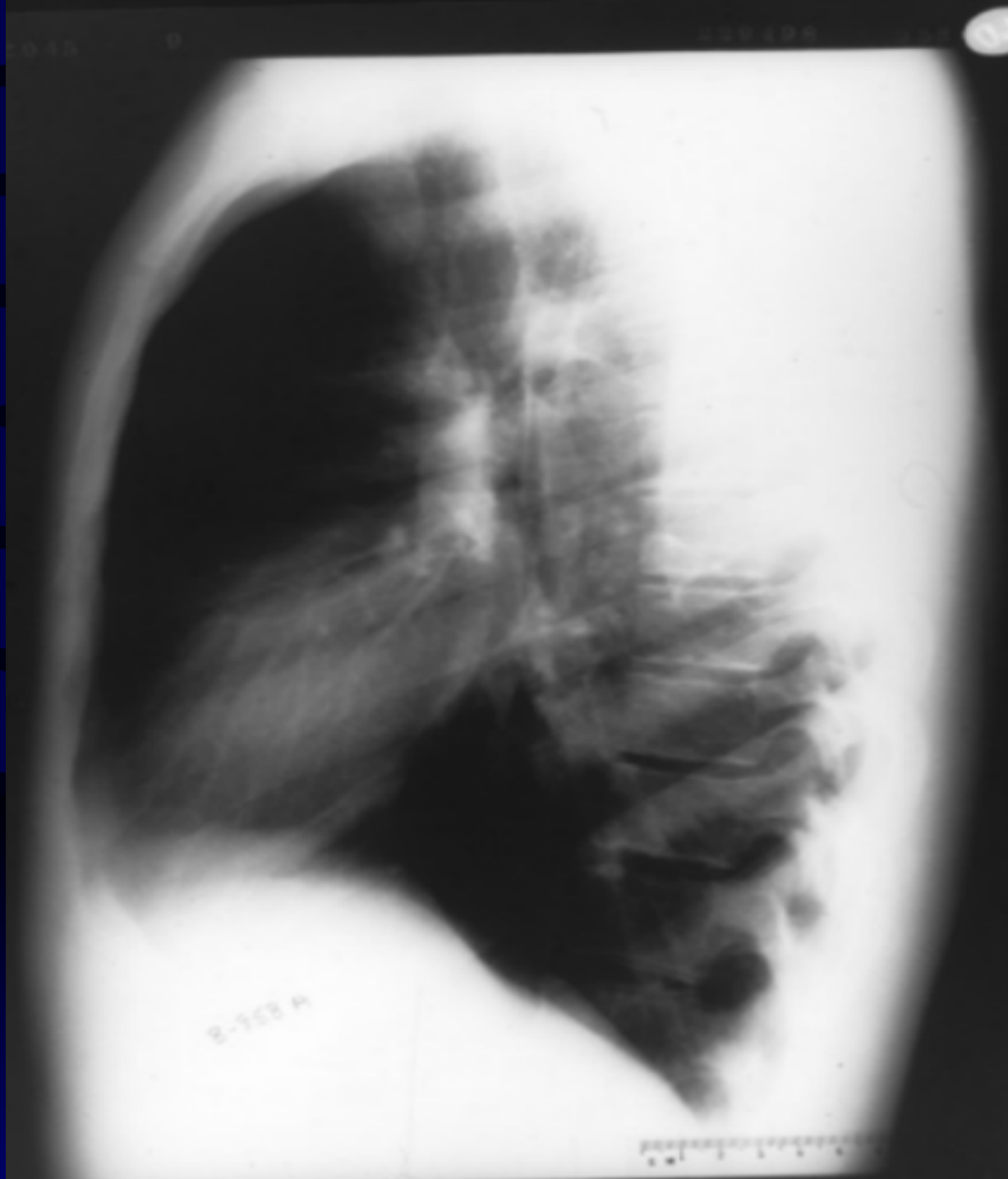
Demystifying lateral view cont.

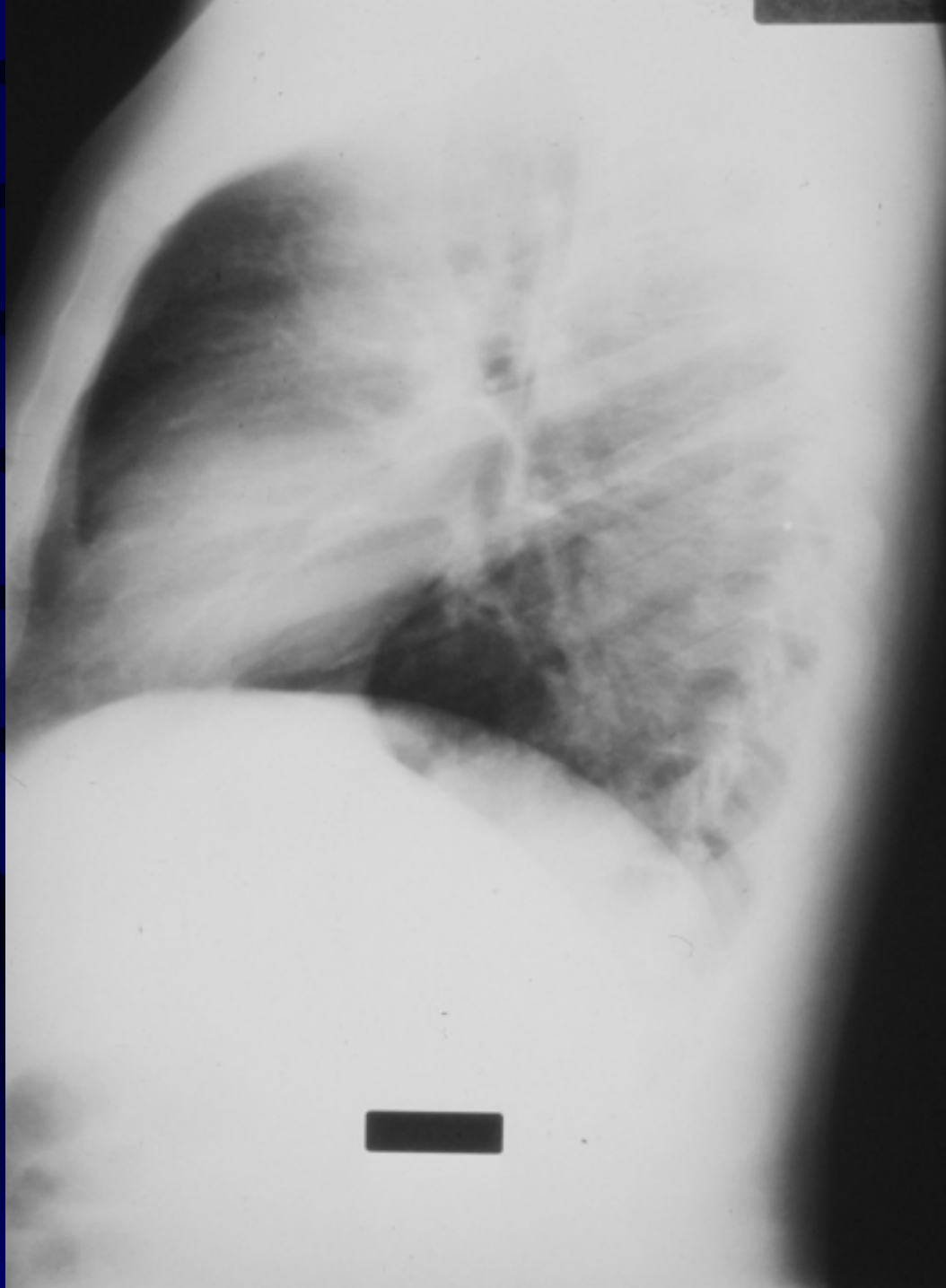
- The relative lucency above the heart shadow is caused by the relative thinness of the mediastinum in that region
- It is thus an example of Rule number 2 and does not have distinct margins
- The thoracic spine always appears increasingly lucent from top to bottom, until it crosses the diaphragms. This is another manifestation of Rule number 2

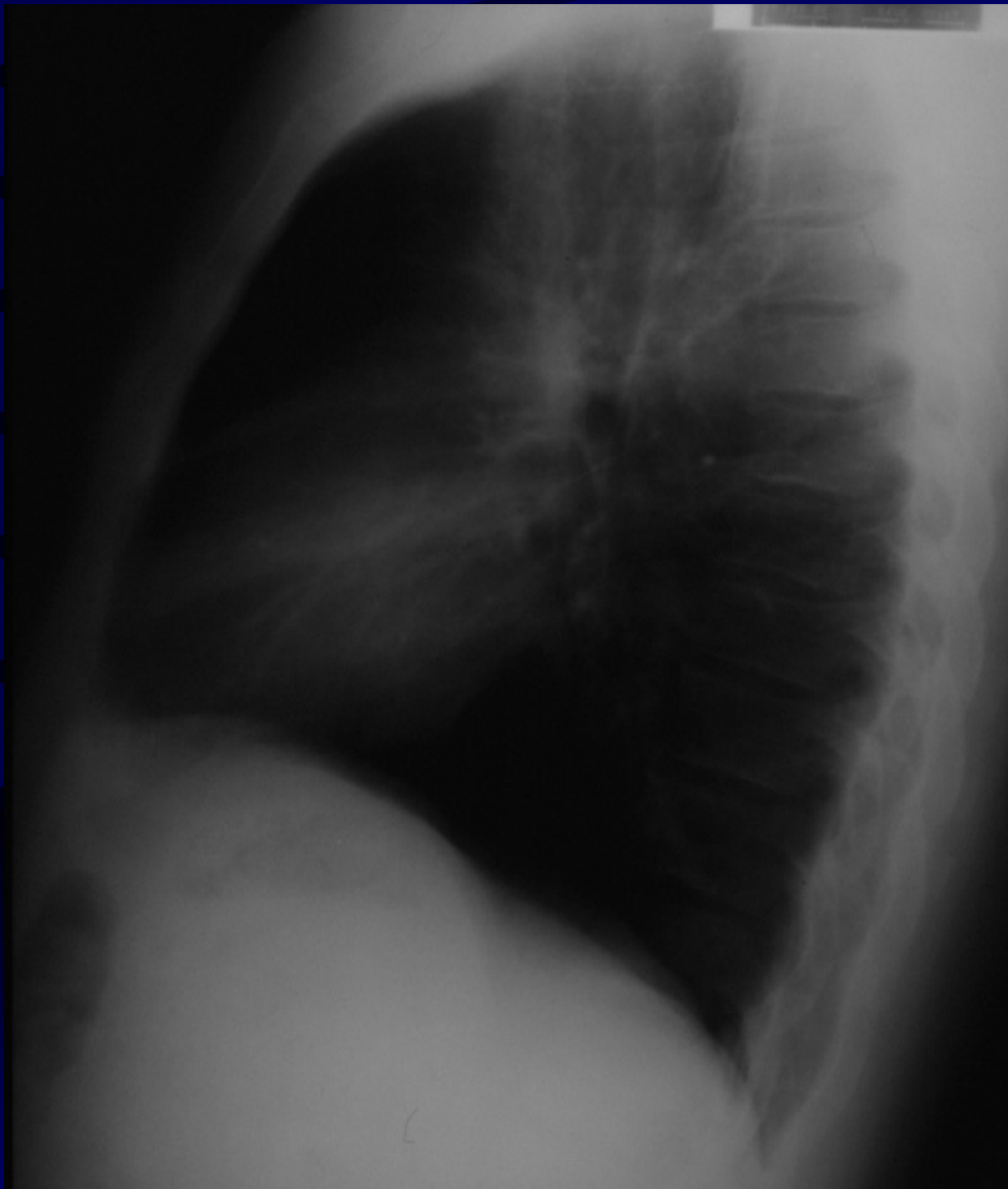


Demystifying lateral view cont.

- The relative lucency above the heart shadow is caused by the relative thinness of the mediastinum in that region
- It is thus an example of Rule number 2 and does not have distinct margins
- The thoracic spine always appears increasingly lucent from top to bottom, until it crosses the diaphragms. This is another manifestation of Rule number 2







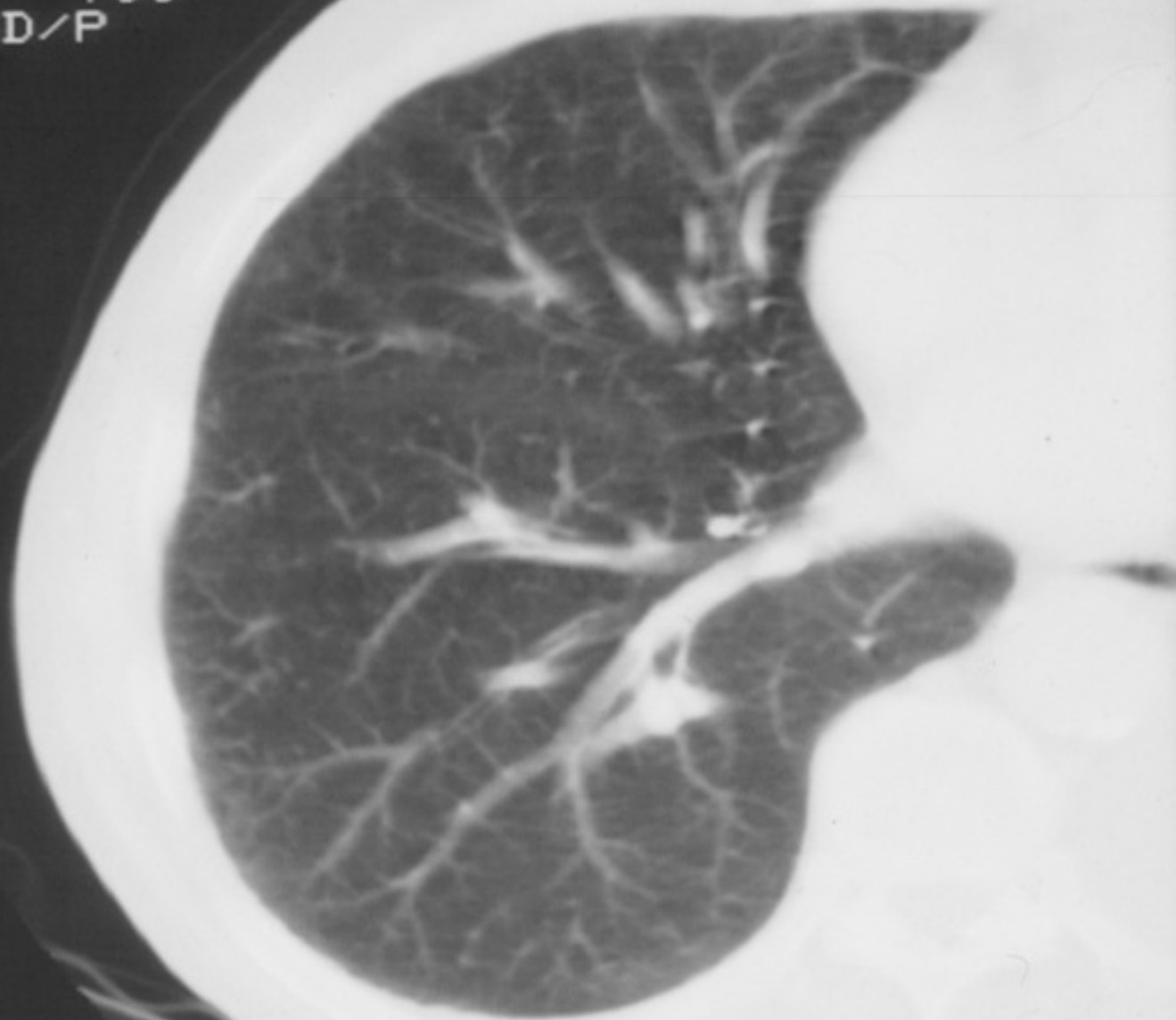
Lungs

- Markings (Vessels)
- Minor fissure

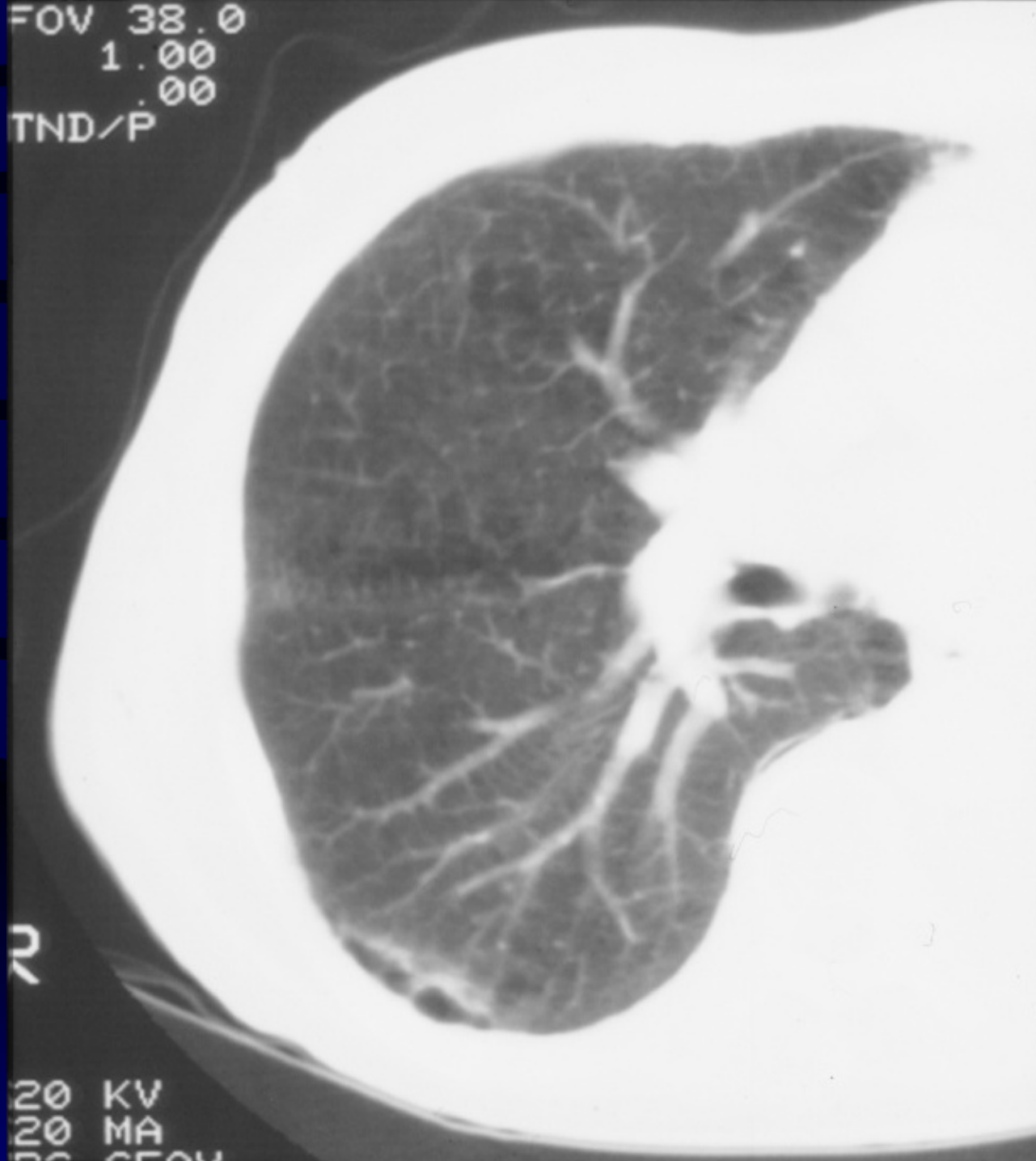


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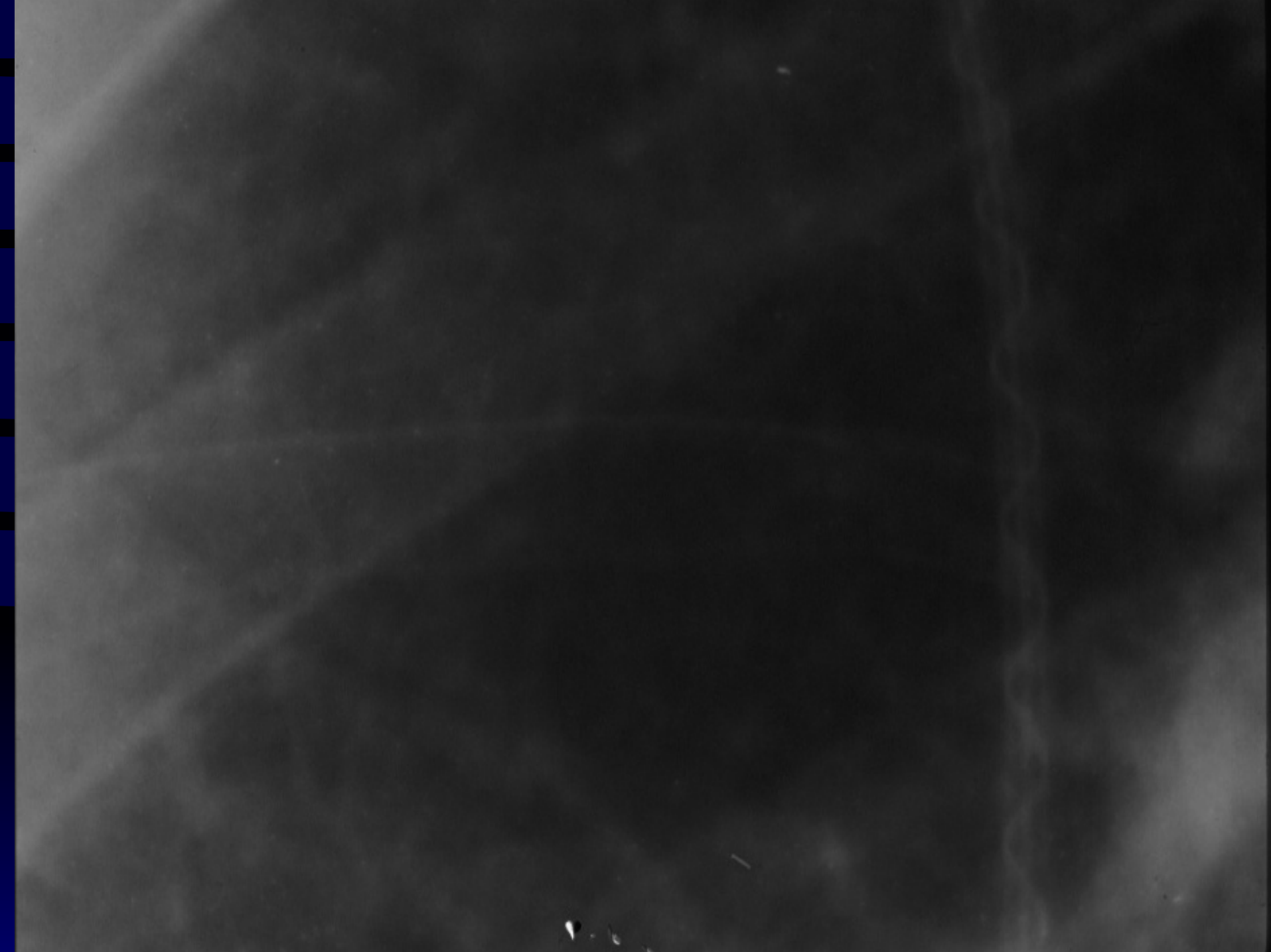
Ø KV



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20 KV
20 MA
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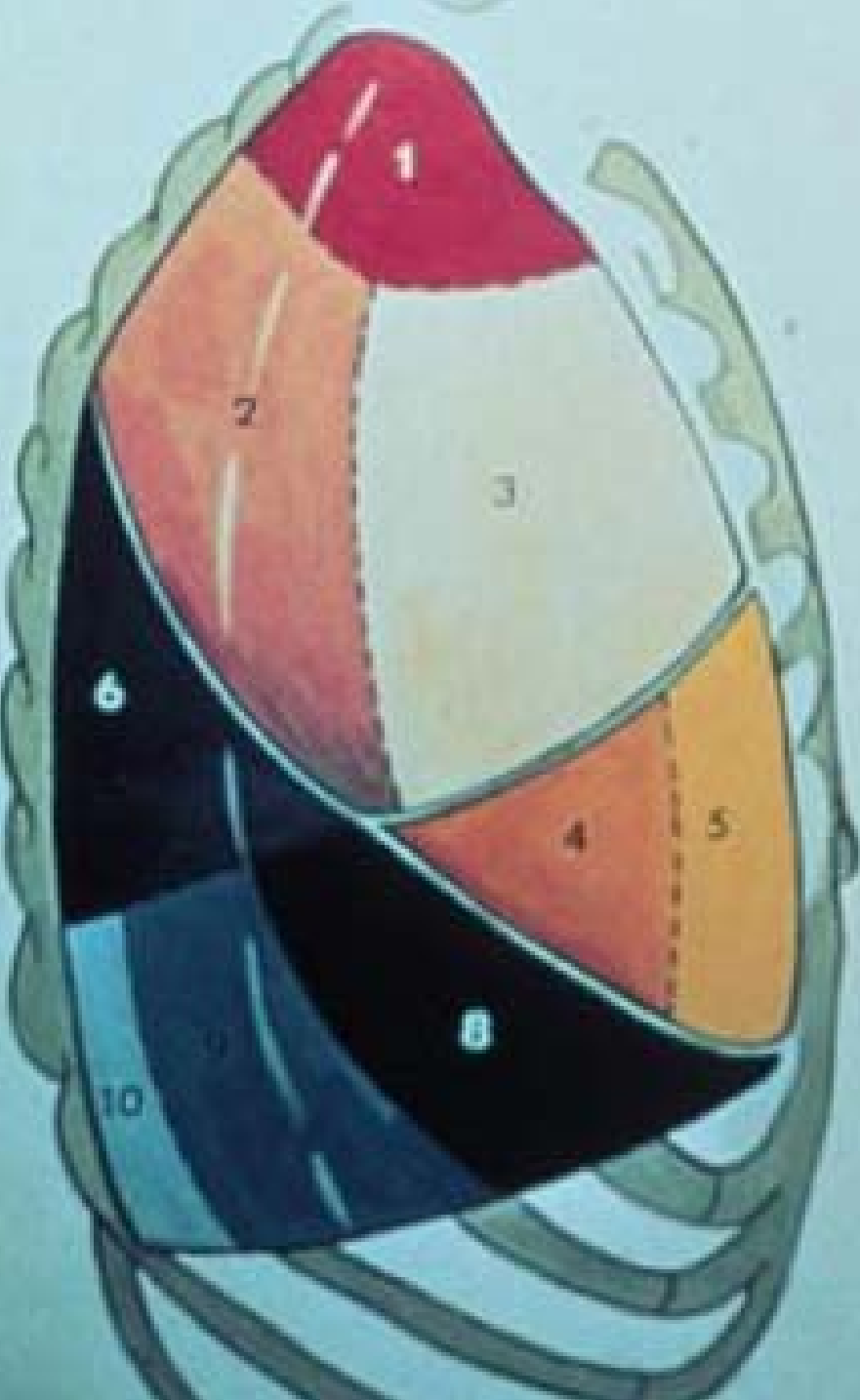
046 - 2



8-959 B



8-959 B





RIGHT LUNG



LEFT LUNG

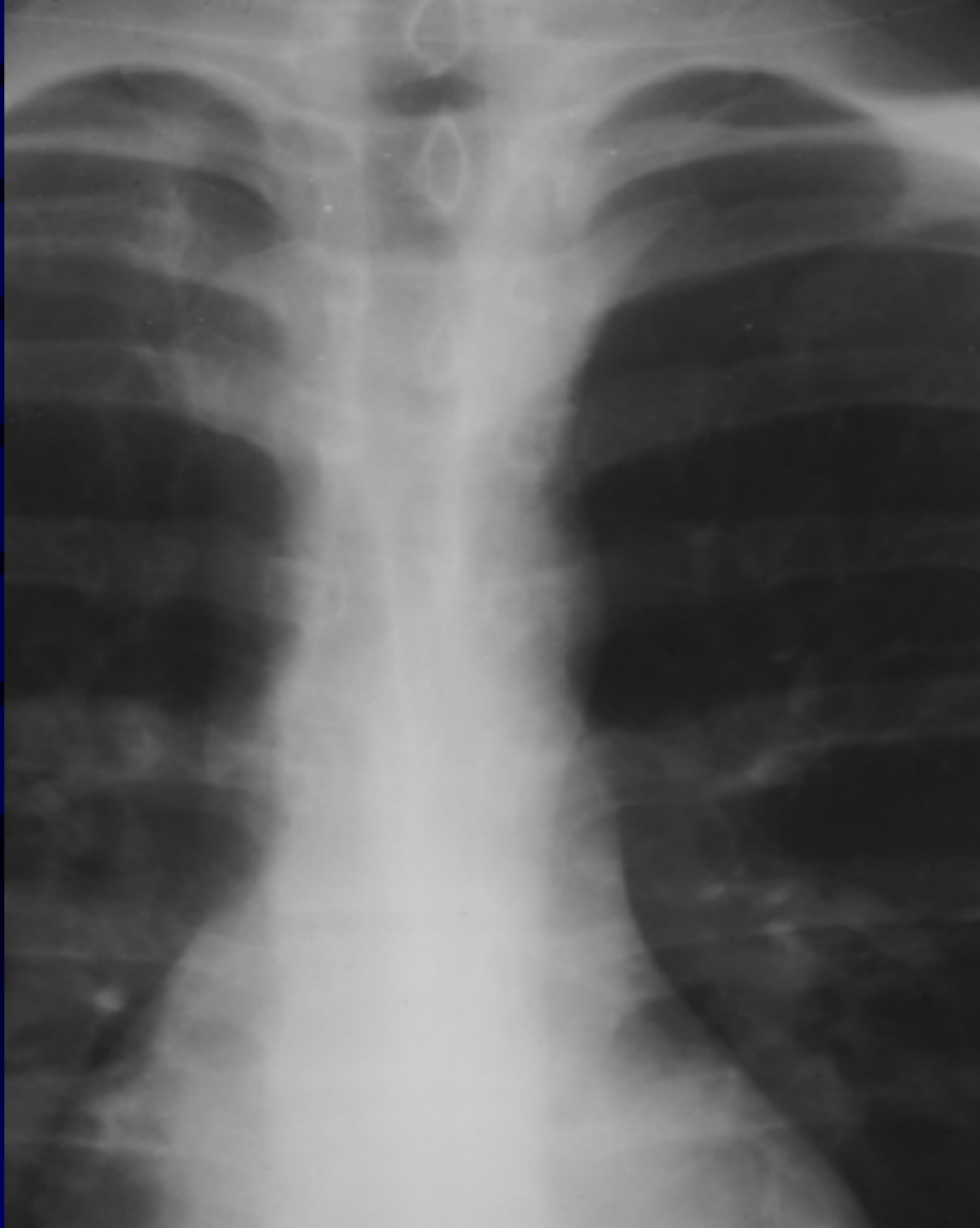


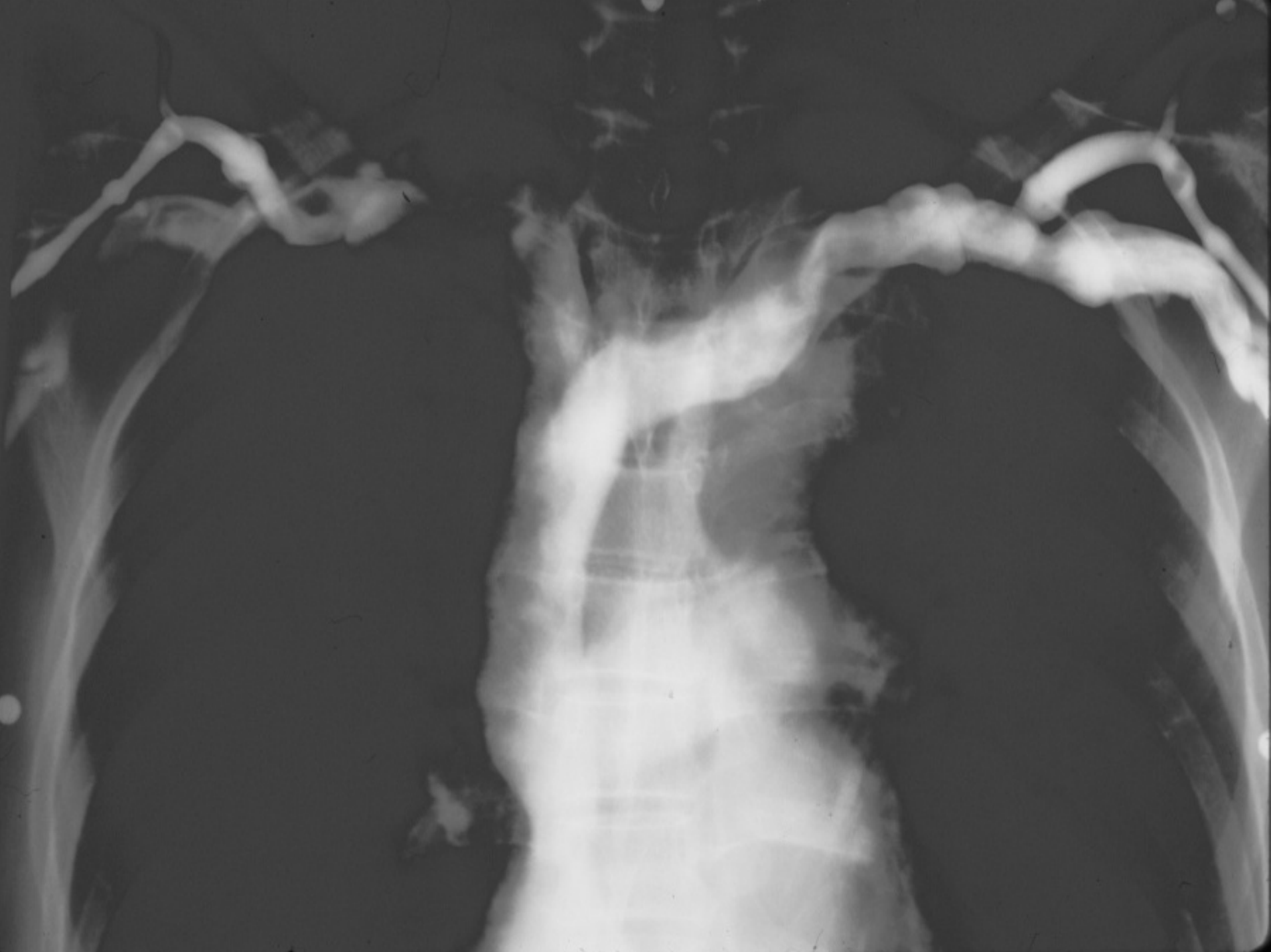
Joe Schuch

Mediastinum

- SVC
- Right paratracheal line







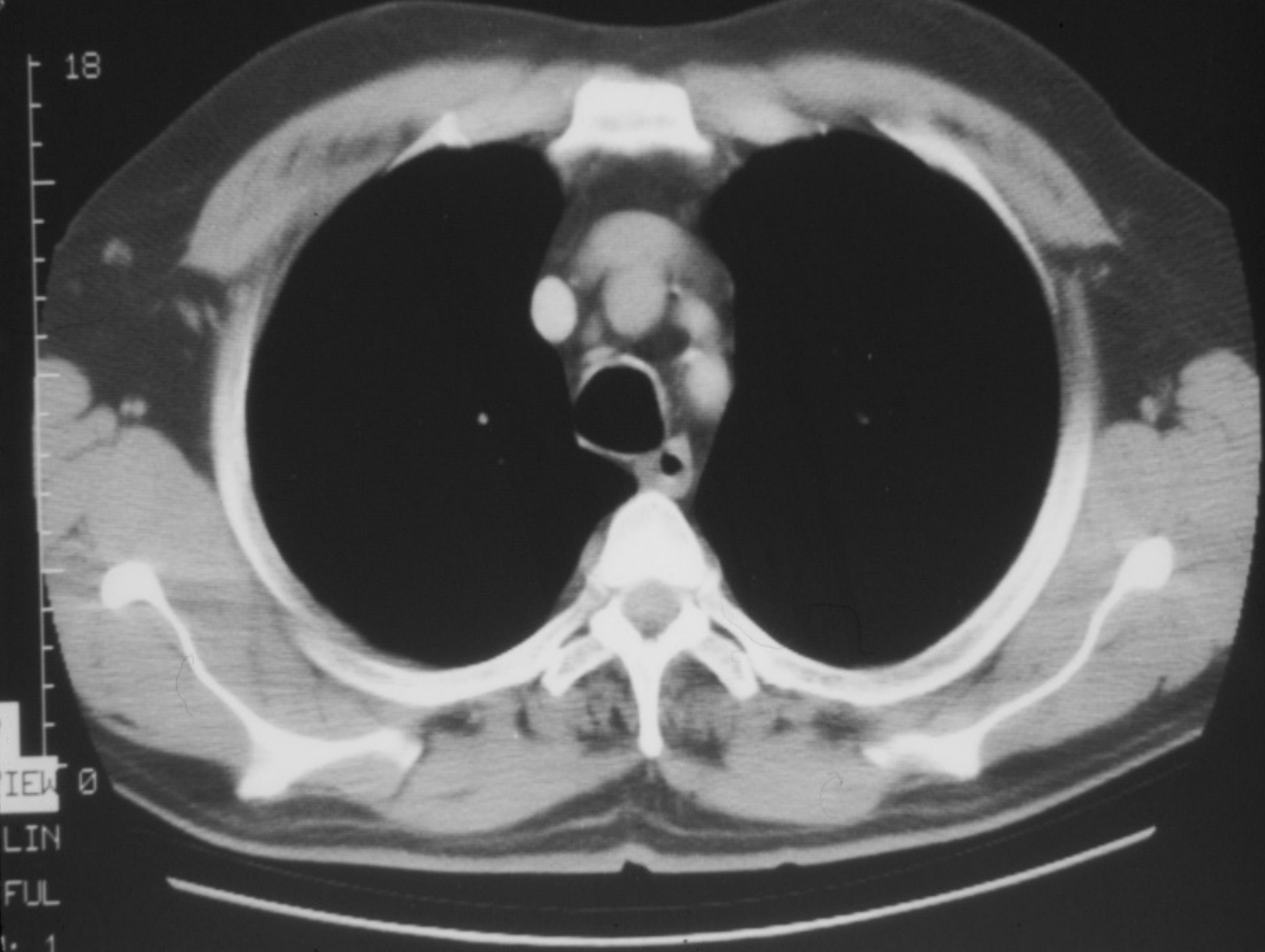
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VIEW 0

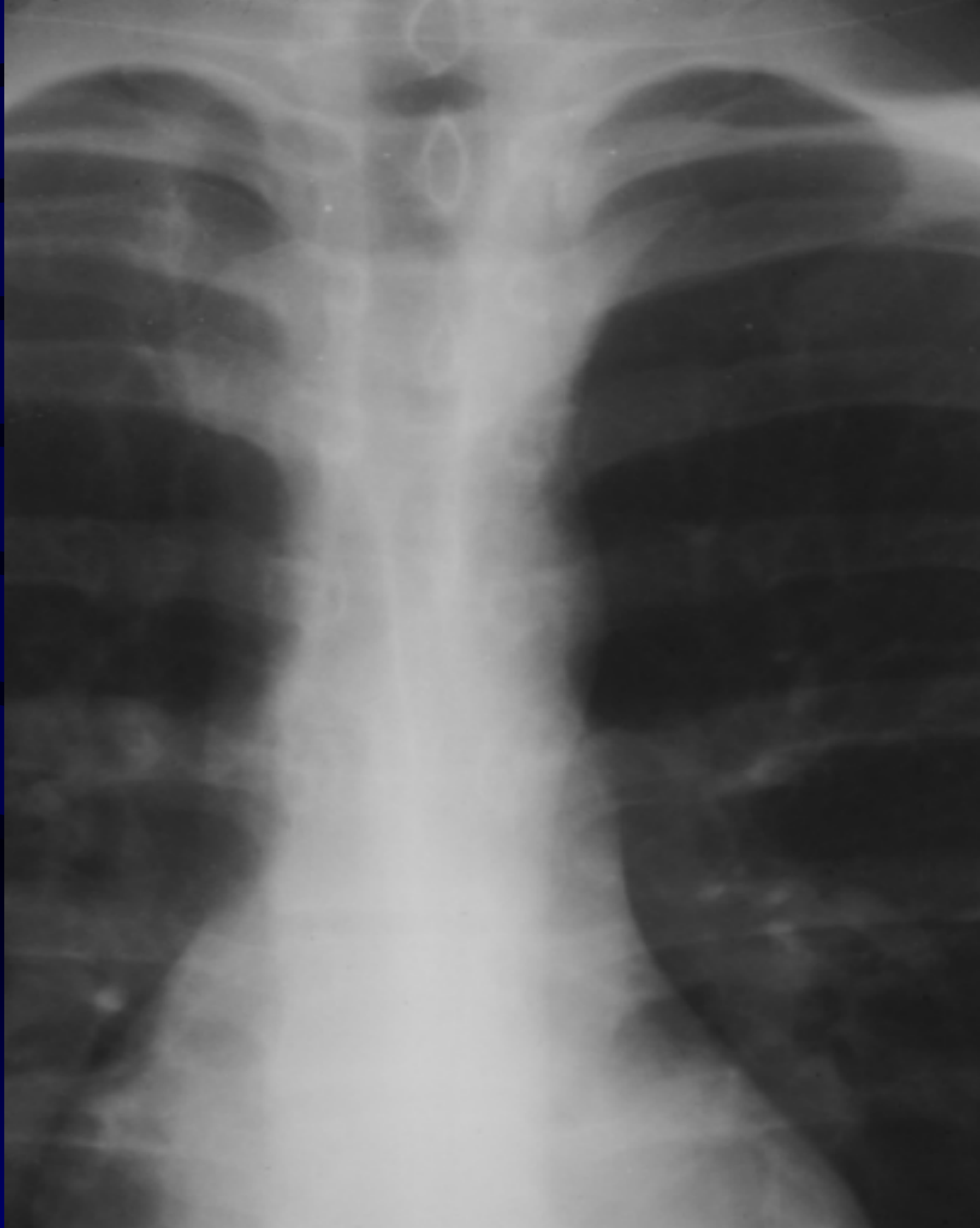
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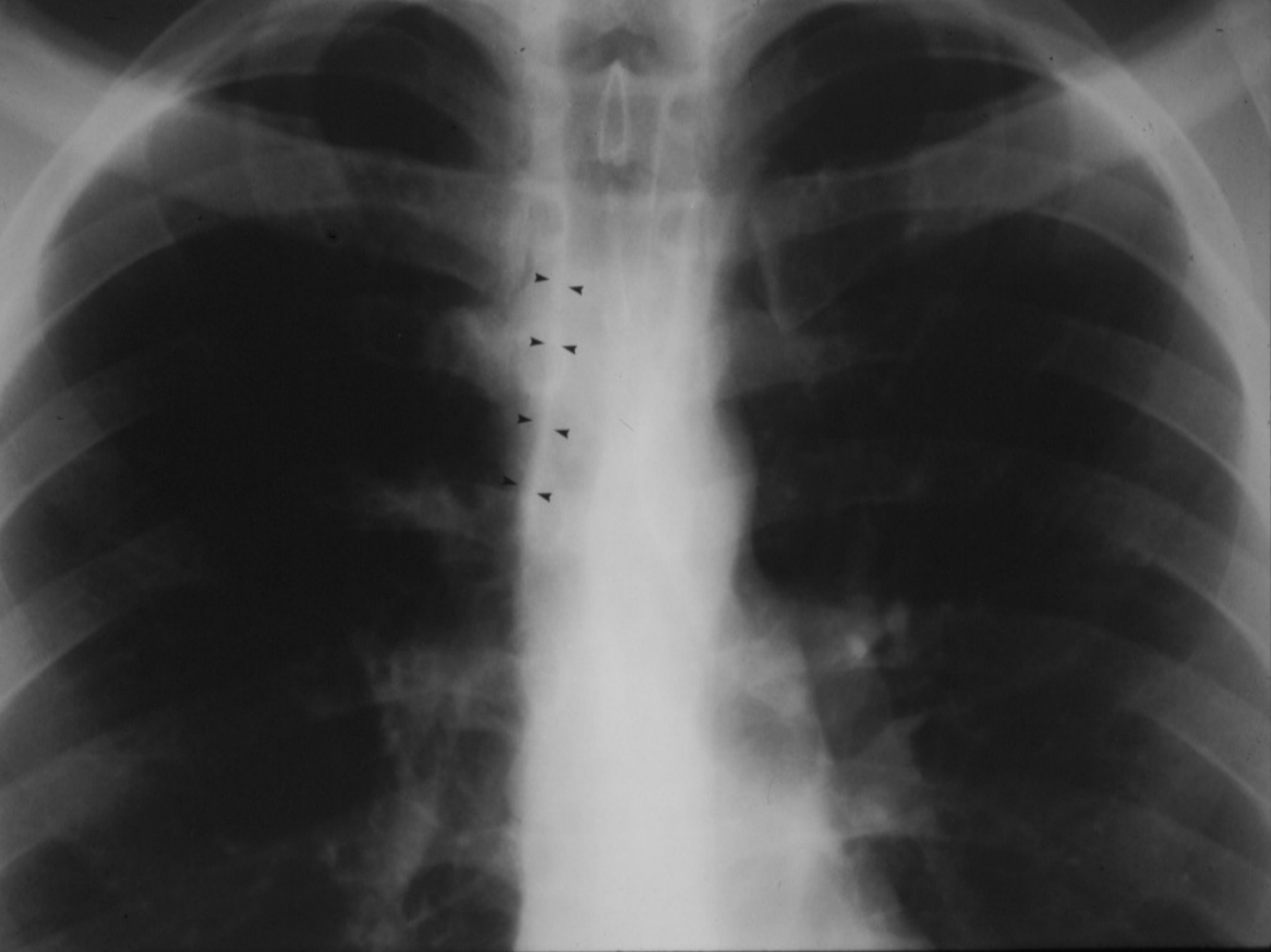
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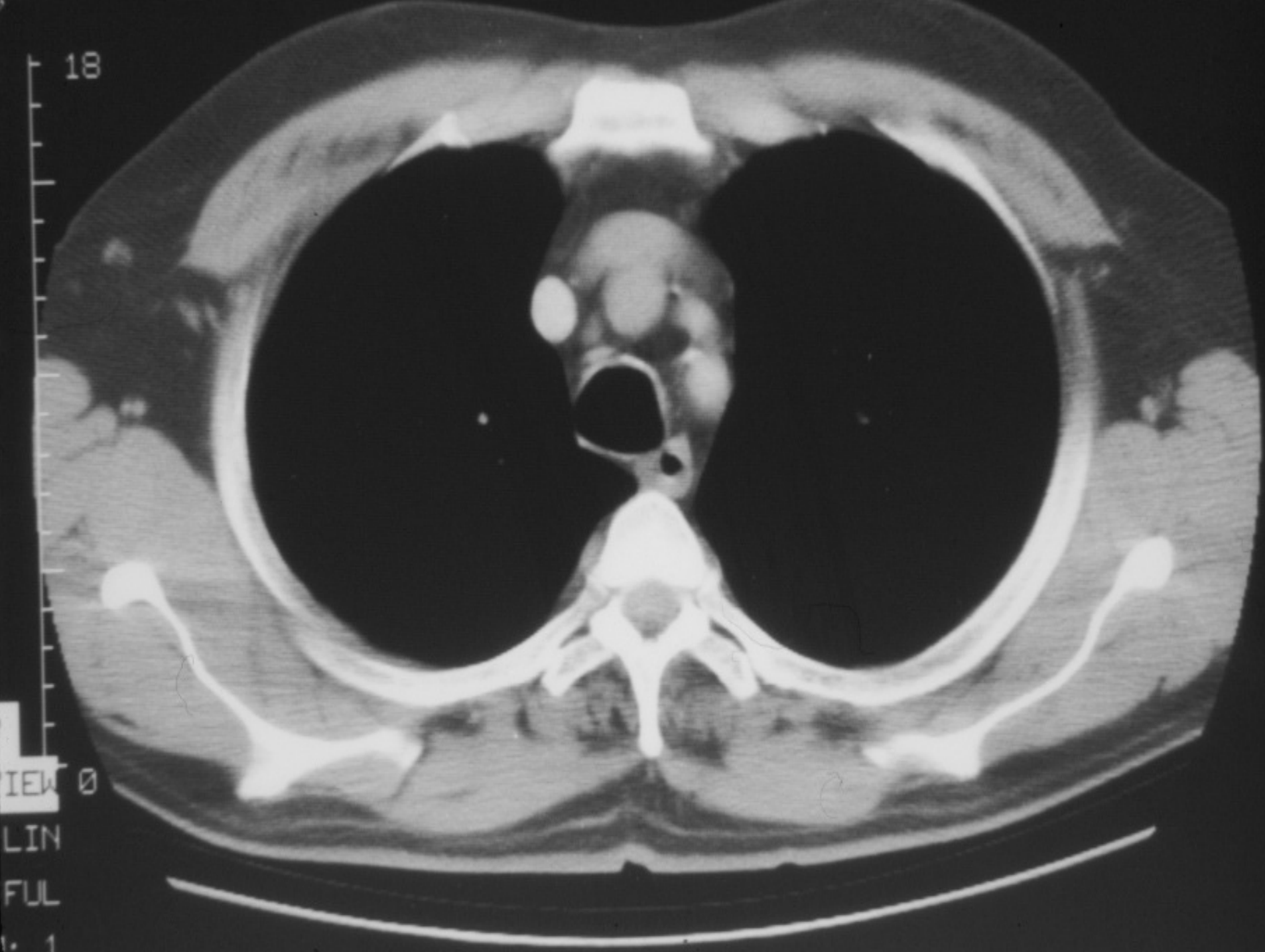
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VIEW 0

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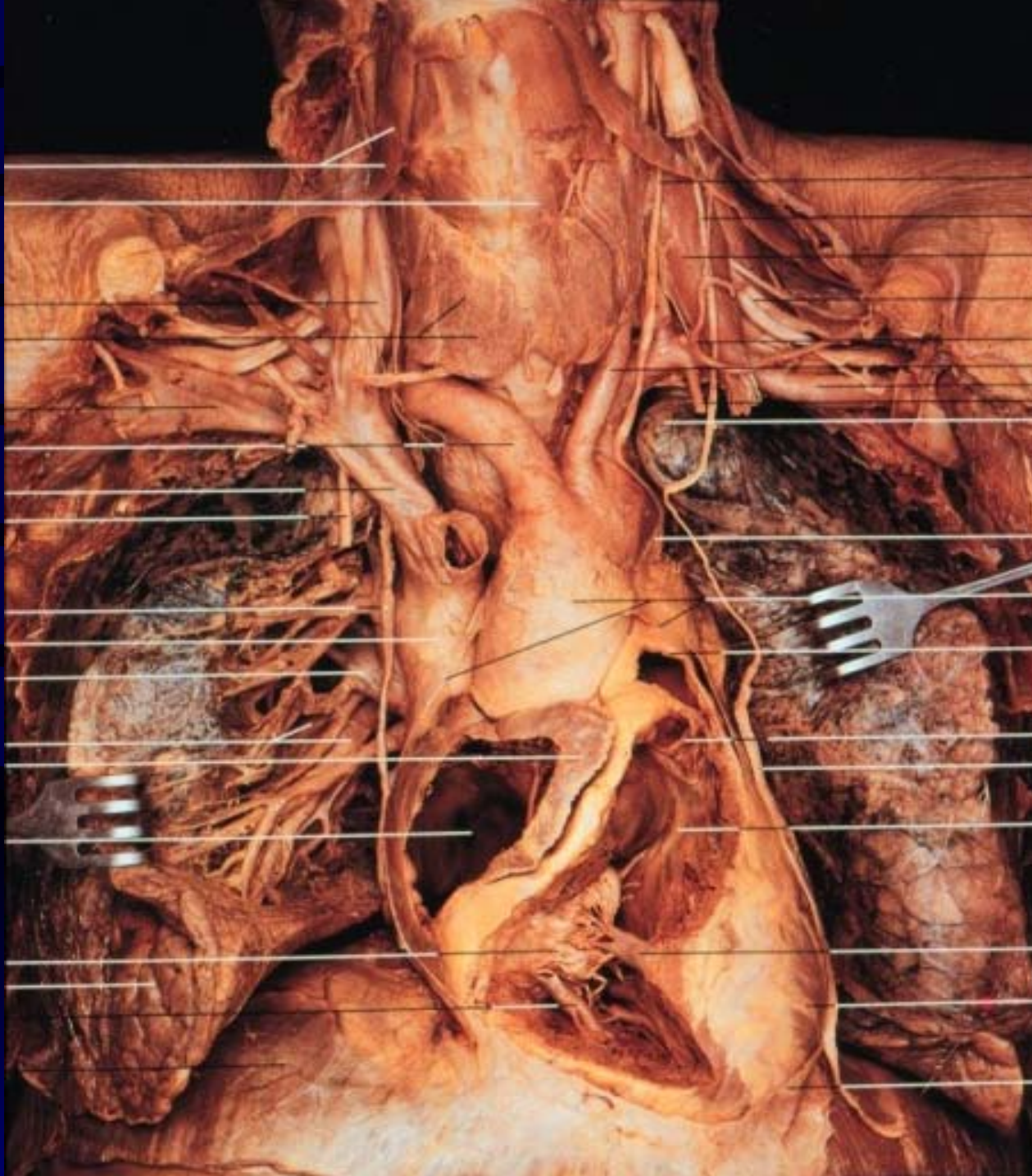


Mediastinum

- Ascending aorta
- Right atrium







STG: 00562
Ser: 003/08
Ima: 004/014

A138

UCSD-AMI
M.R. INSTITUTE

1-Oct-86 11:52

SLATER, AILEEN

F 61 150 lbs.

6/23/25

Field: 1.5 T
CARD VEMP

TR : 2045

TE : 60

Echo : 2 of 2

Mode : Multi

D Acq: 256x128

FOV : 32 cm

Thk : 10 mm

Nex : 2

14 Imgs Scanned
Acq Time: 08:51

Cardiac Gated

H Rate: 88 bpm

Trg DI: 106 ms

R 159

L 161

P182



'88

18

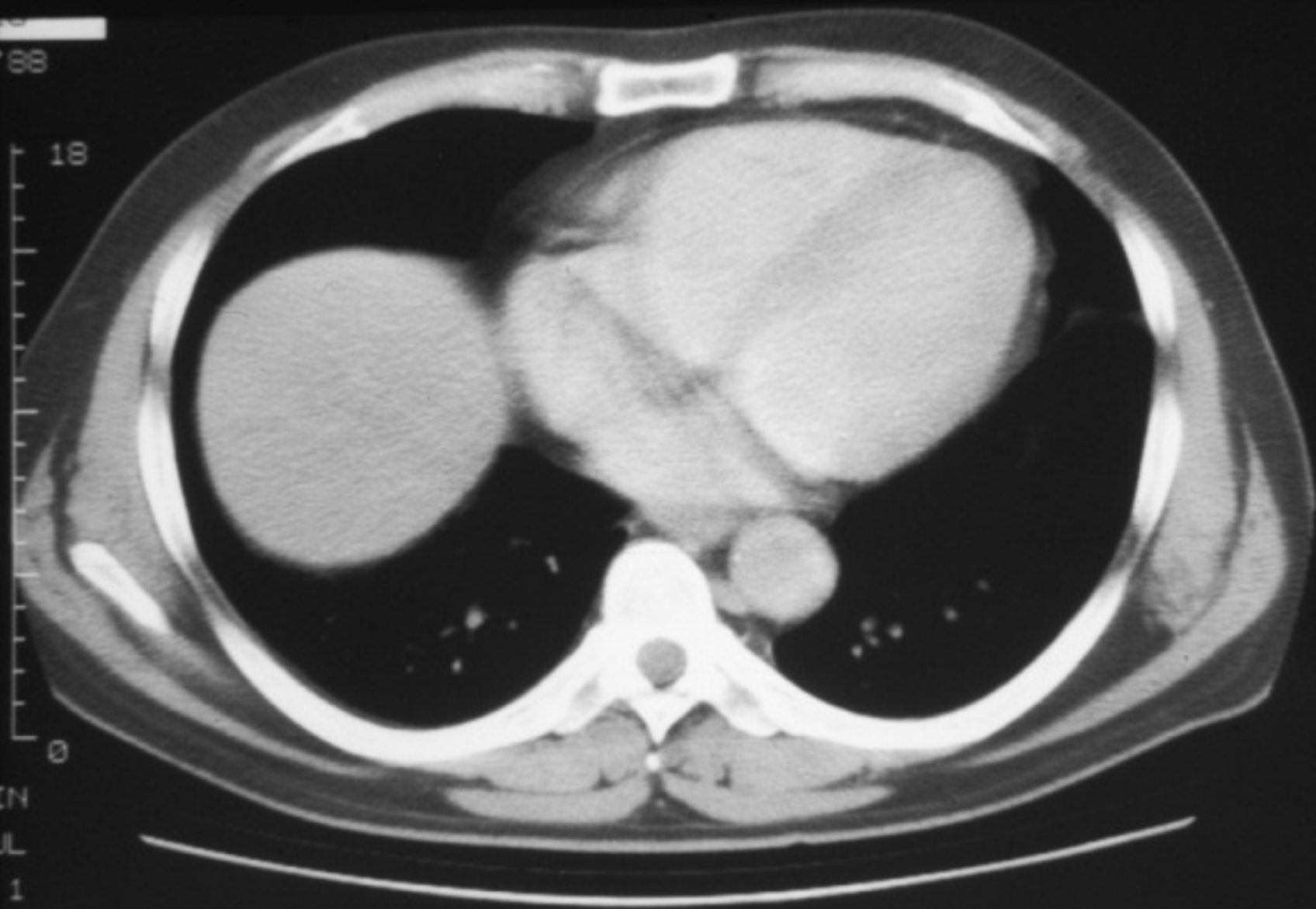


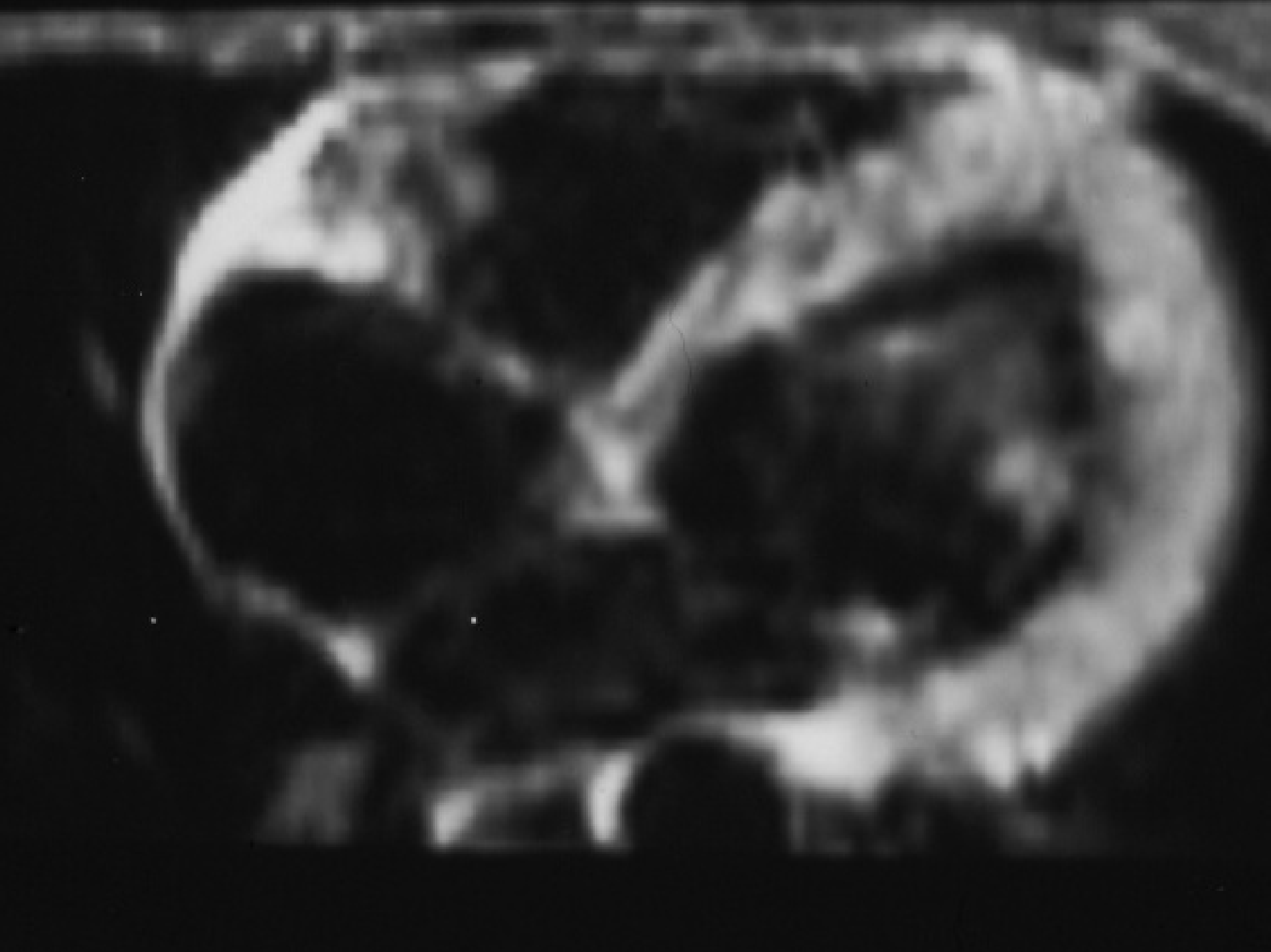
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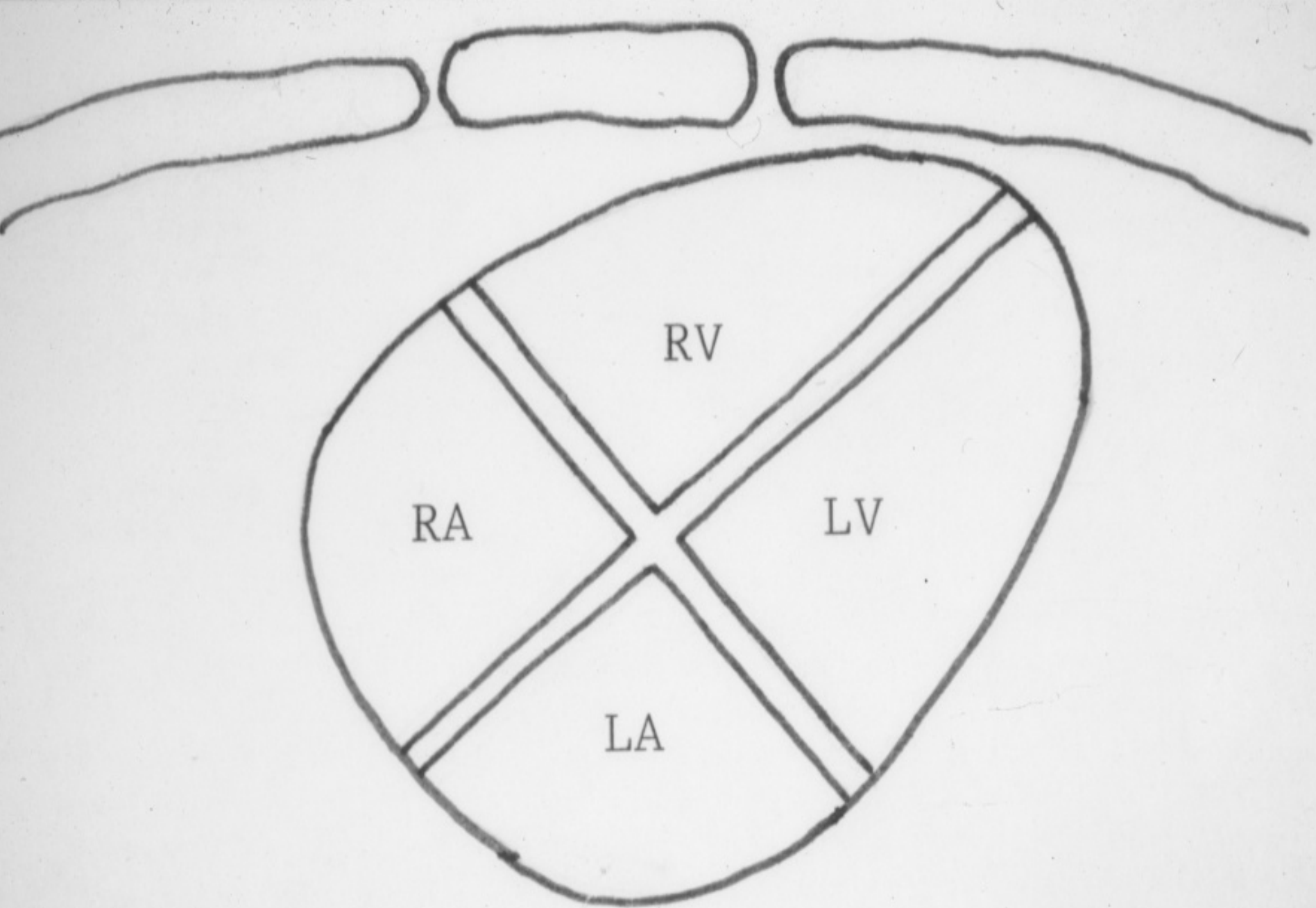
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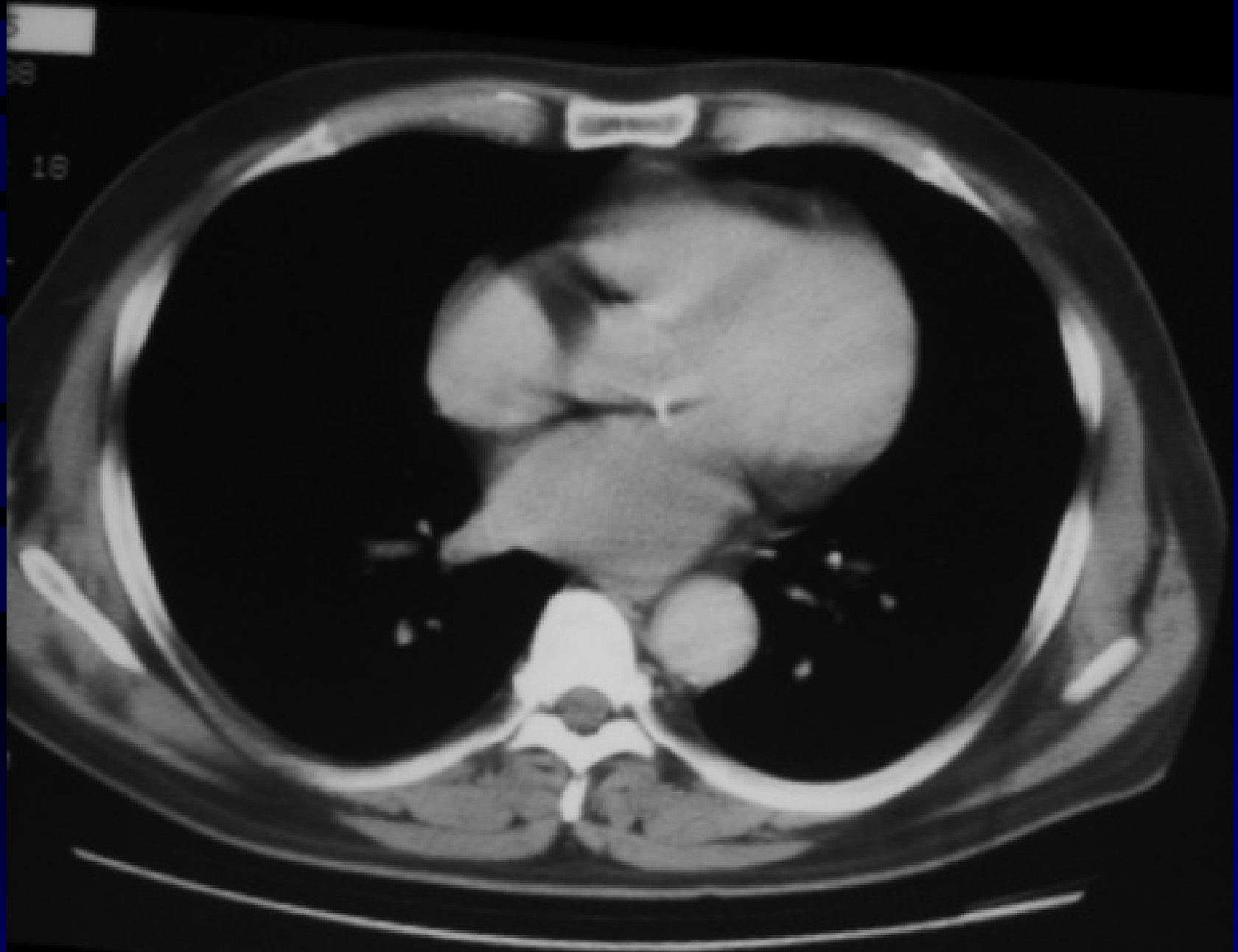
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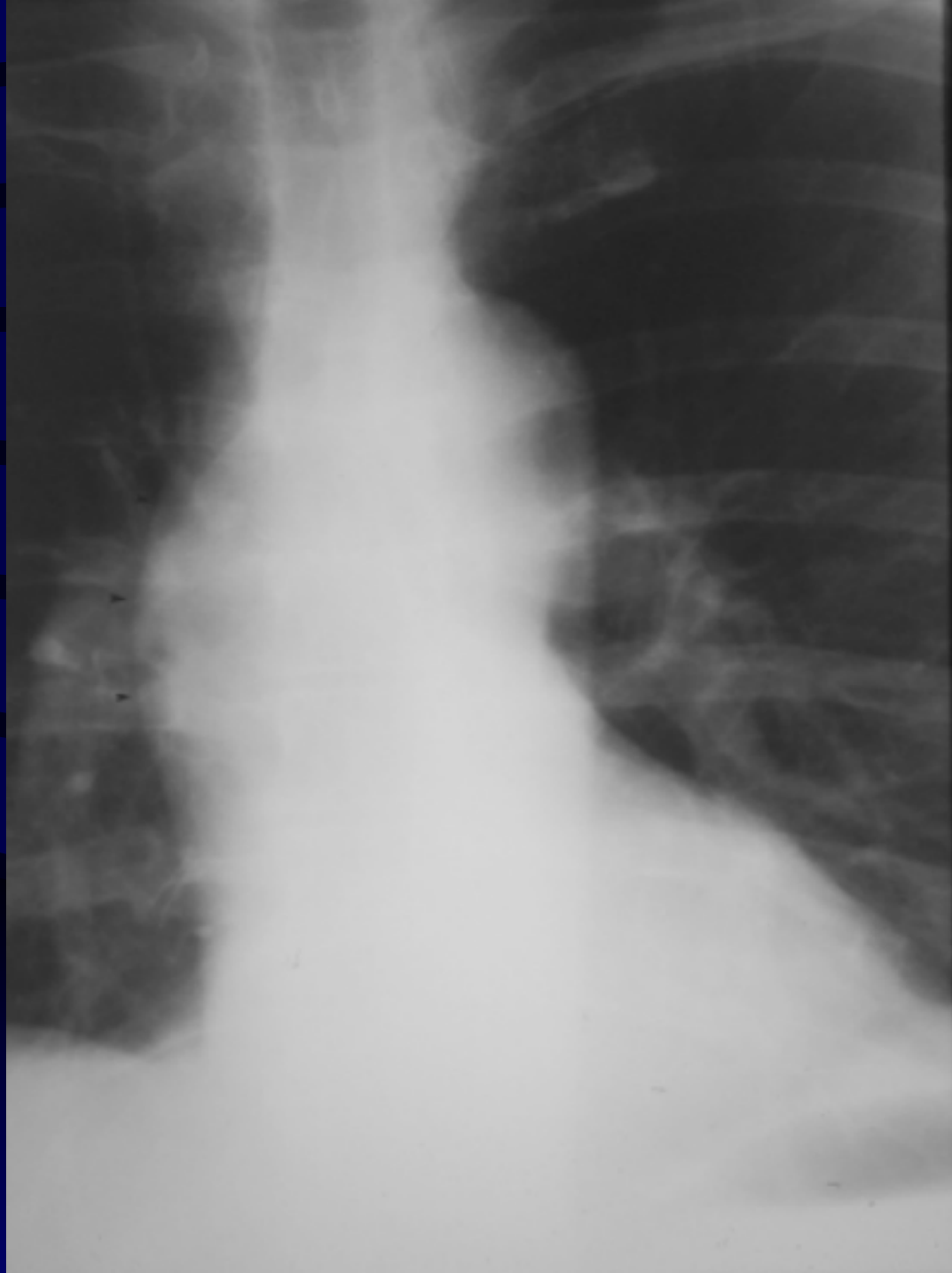
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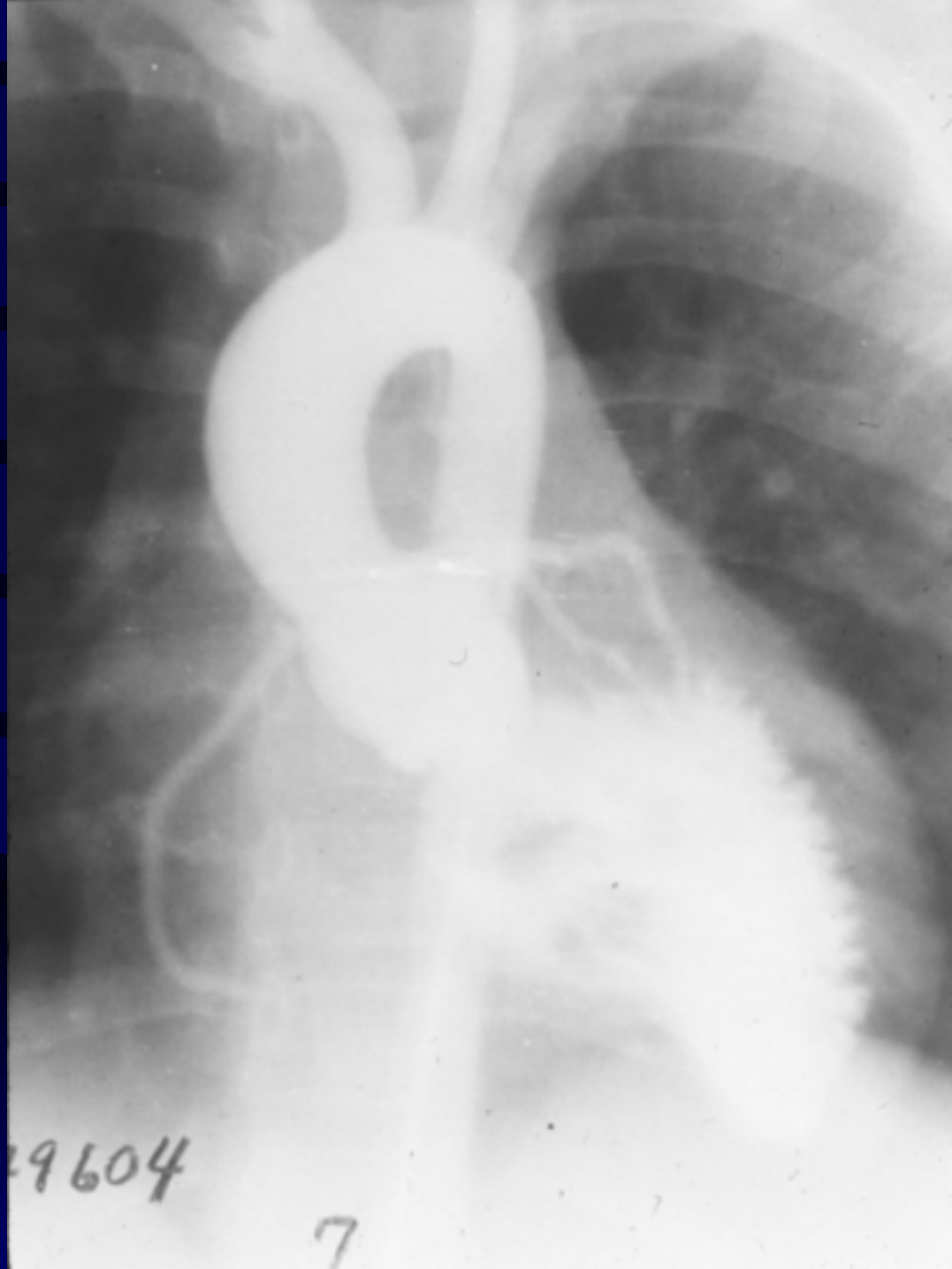








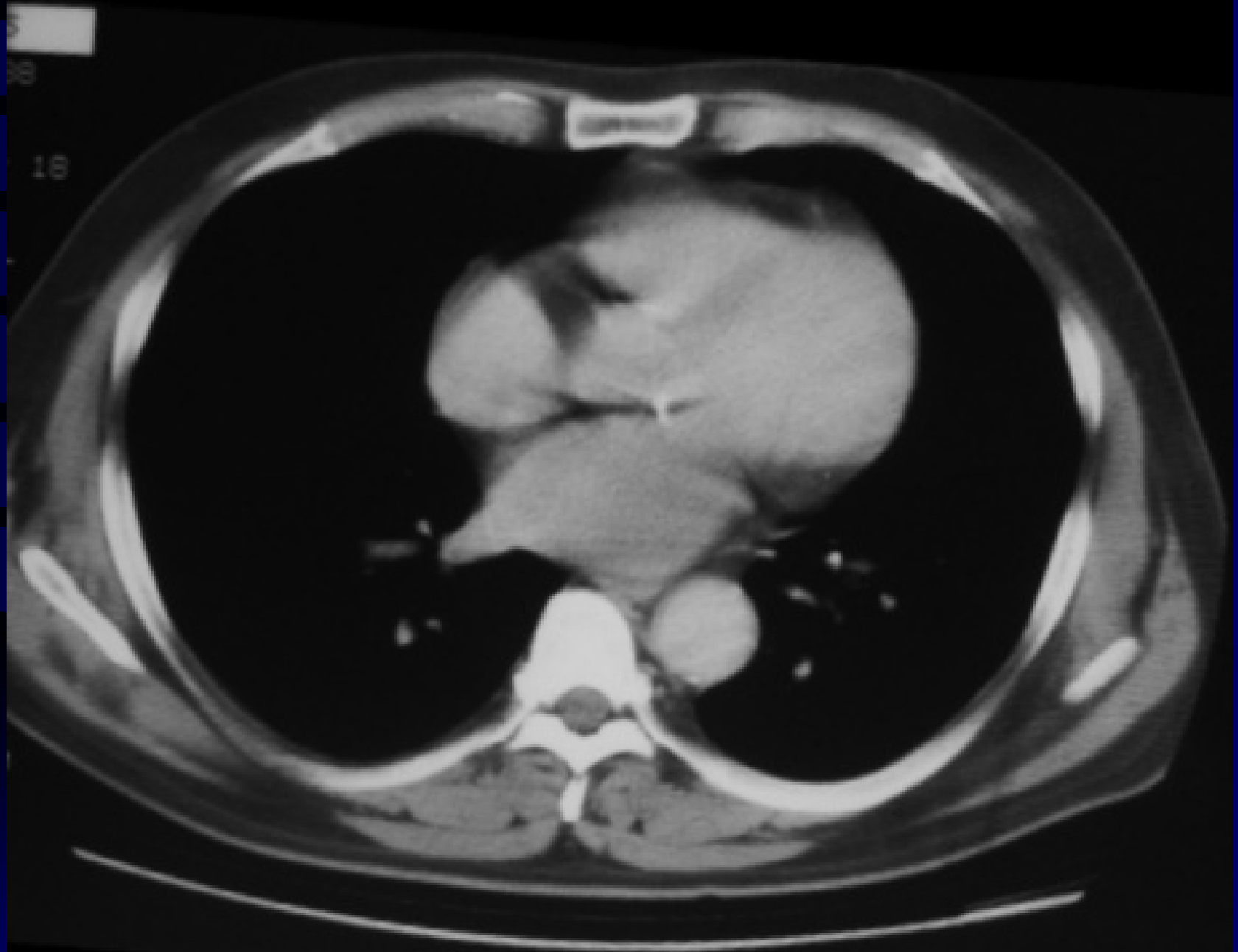




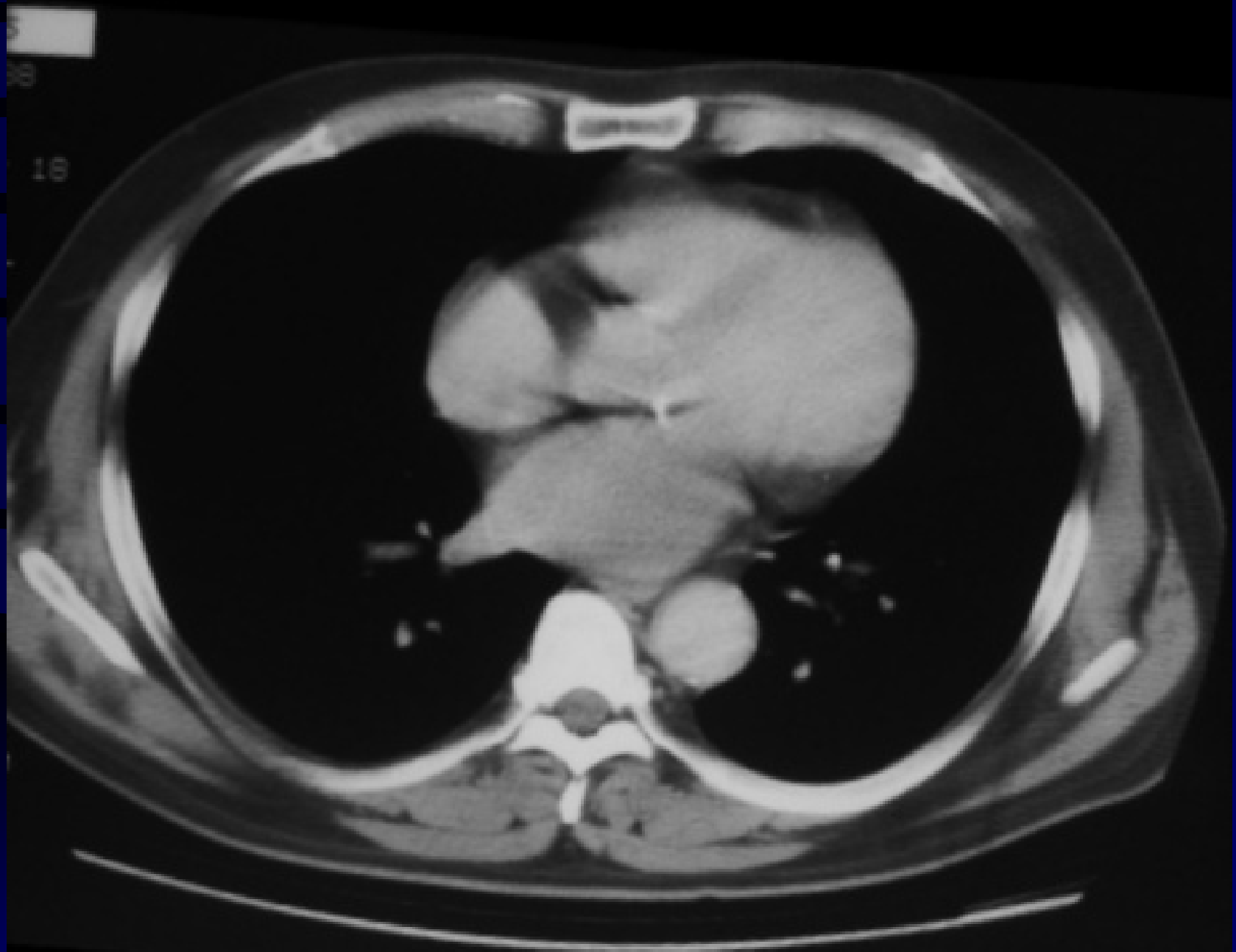
Mediastinum

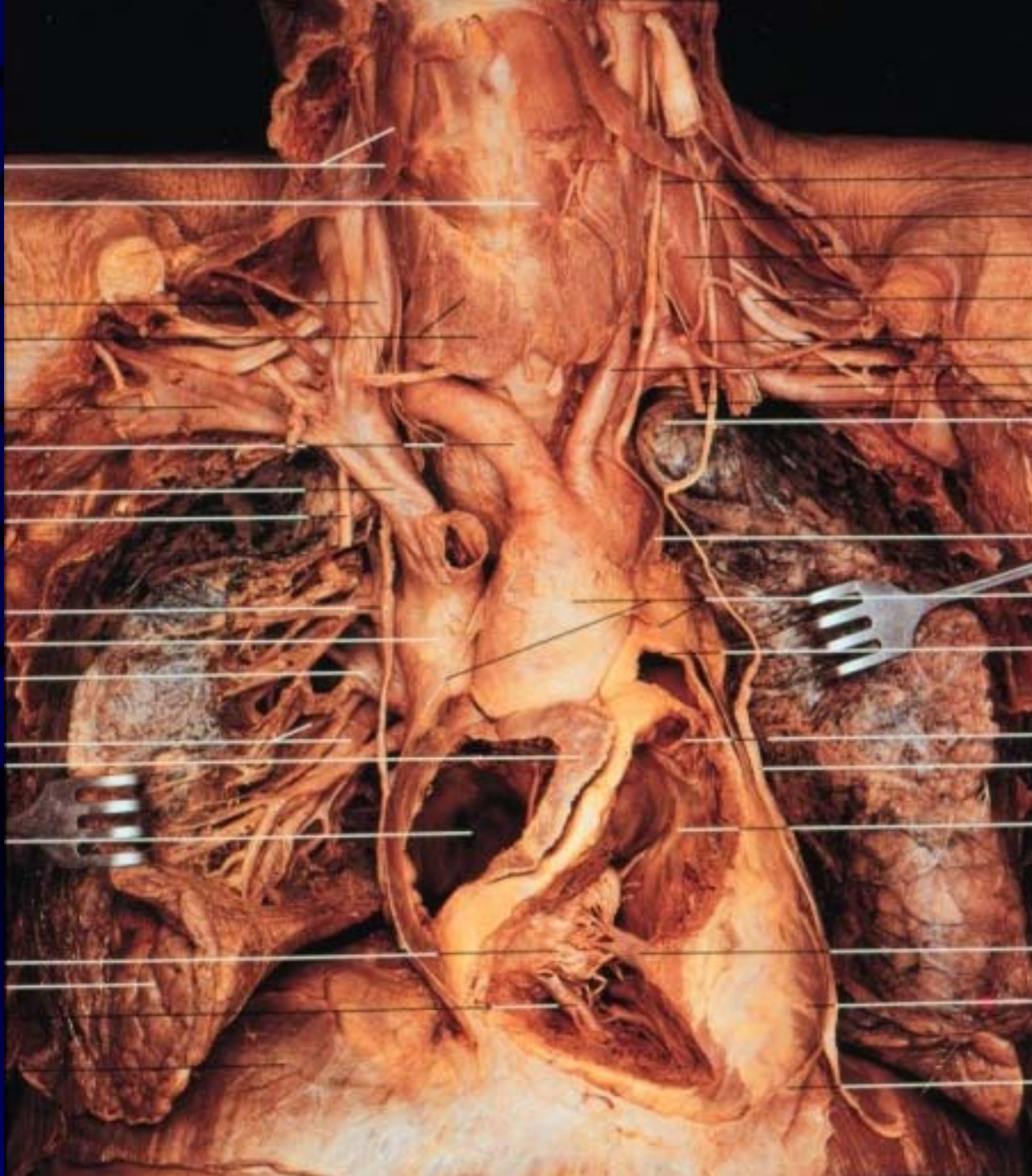
- Left ventricle
- Main pulmonary artery (Trunk)





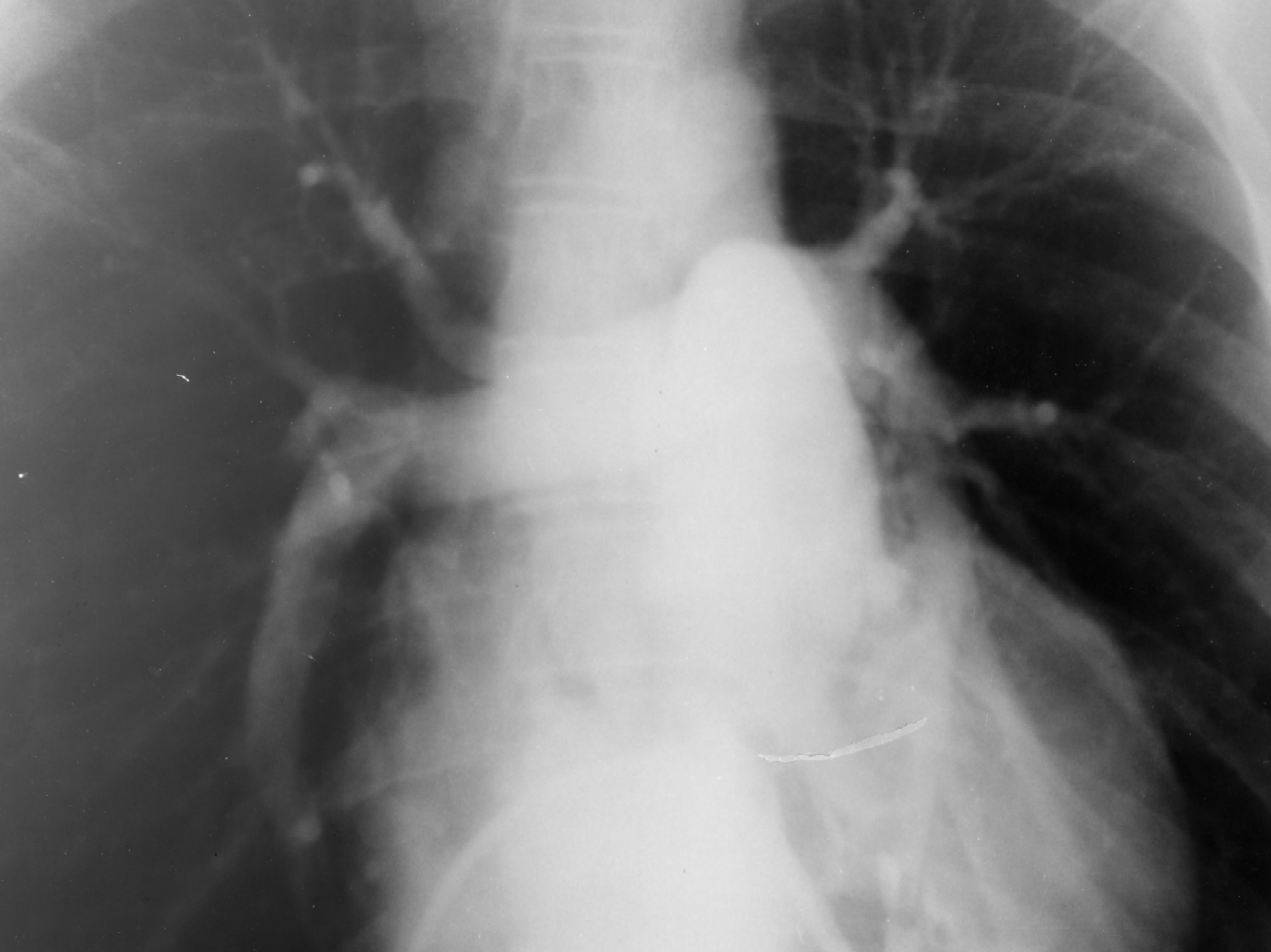








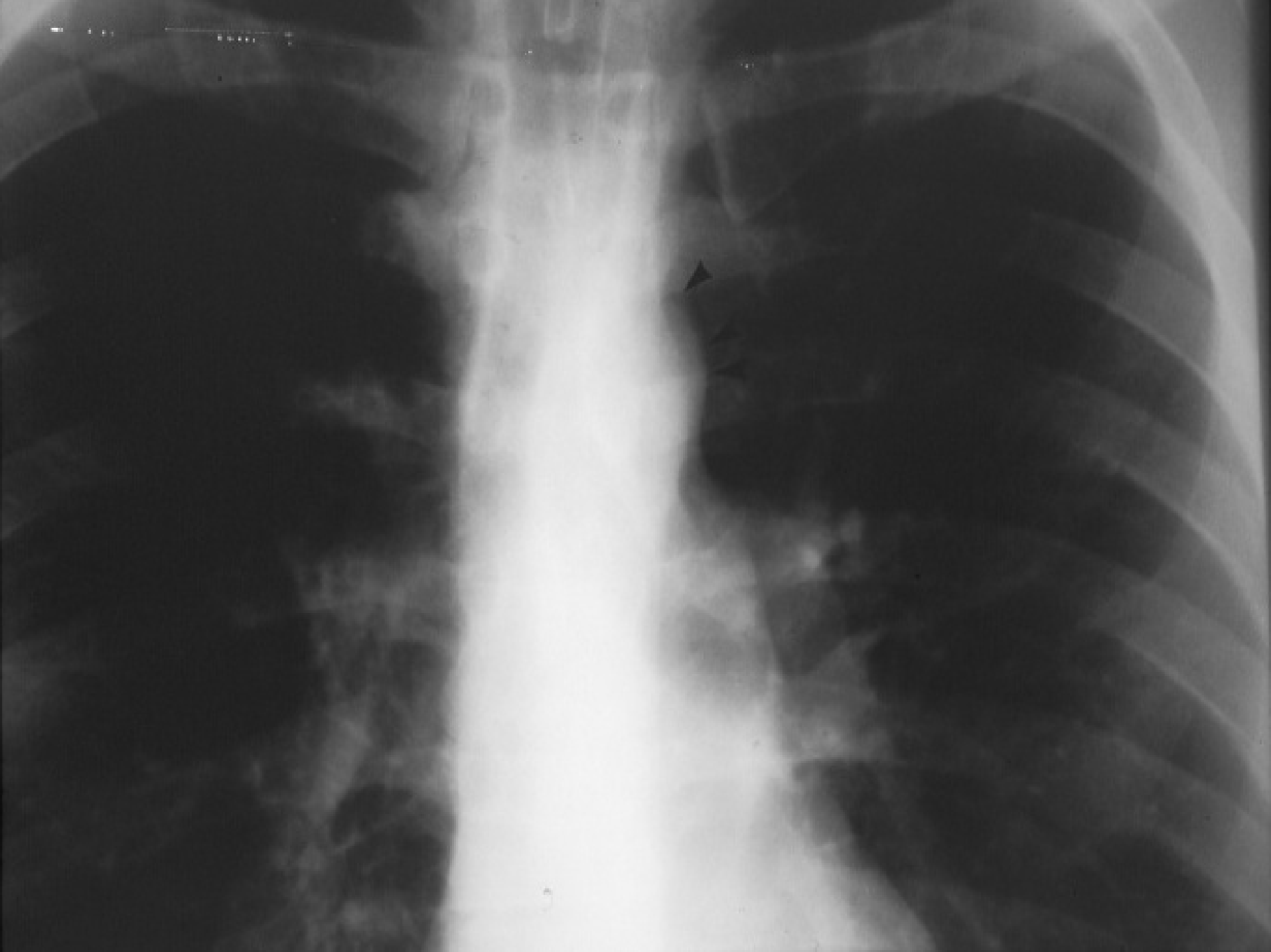


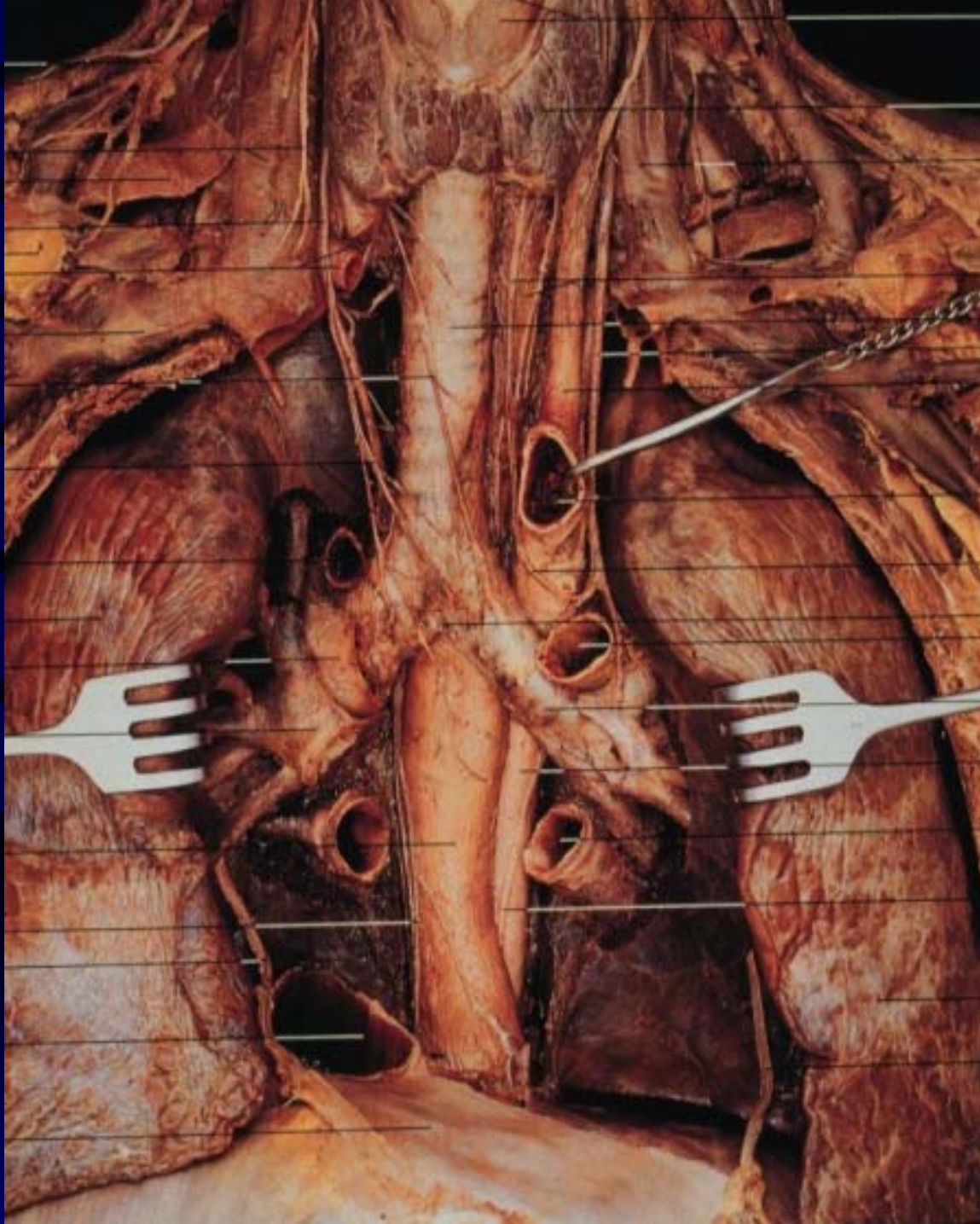


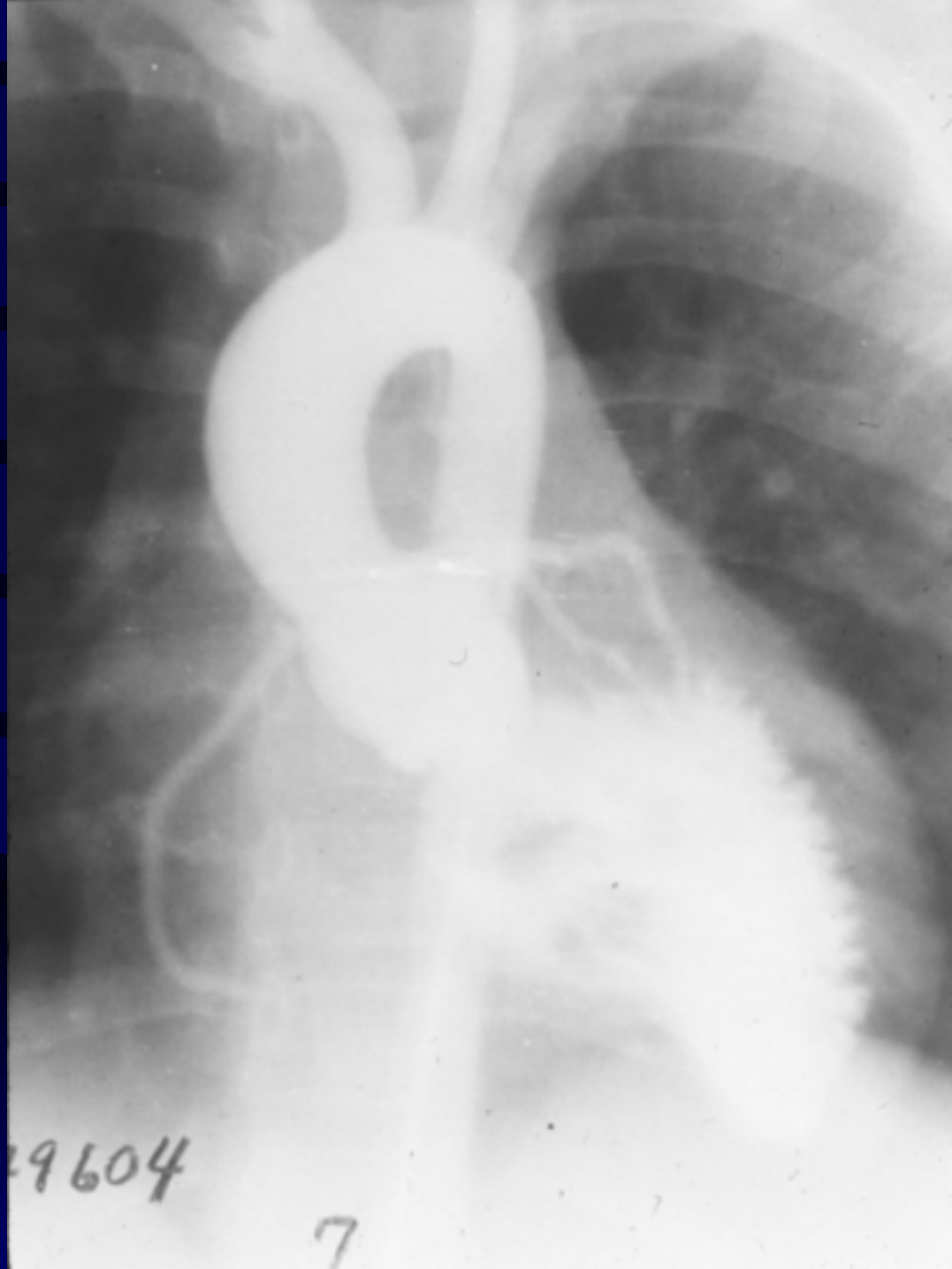
Mediastinum

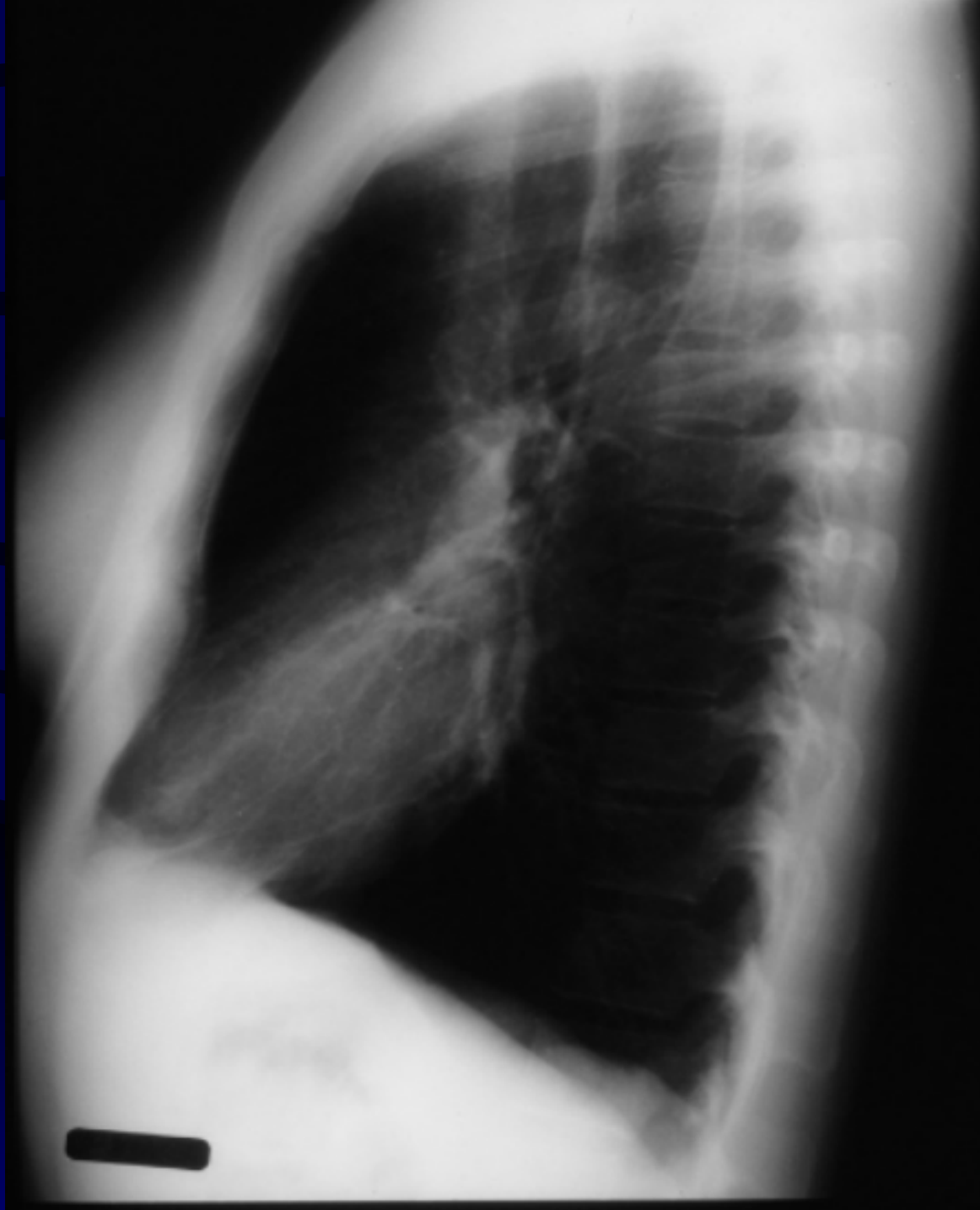
- Aortico-Pulmonary Notch
- Aortic Knob
- Descending aorta

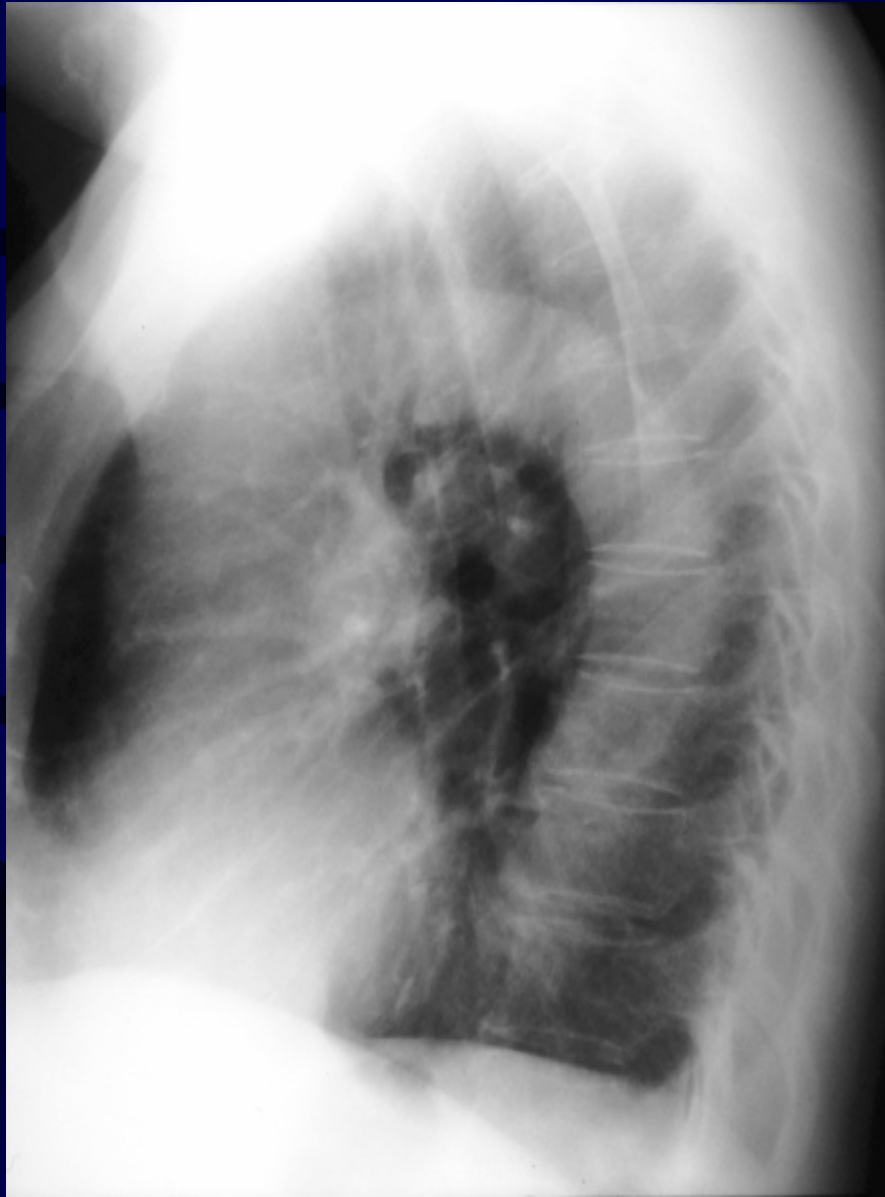






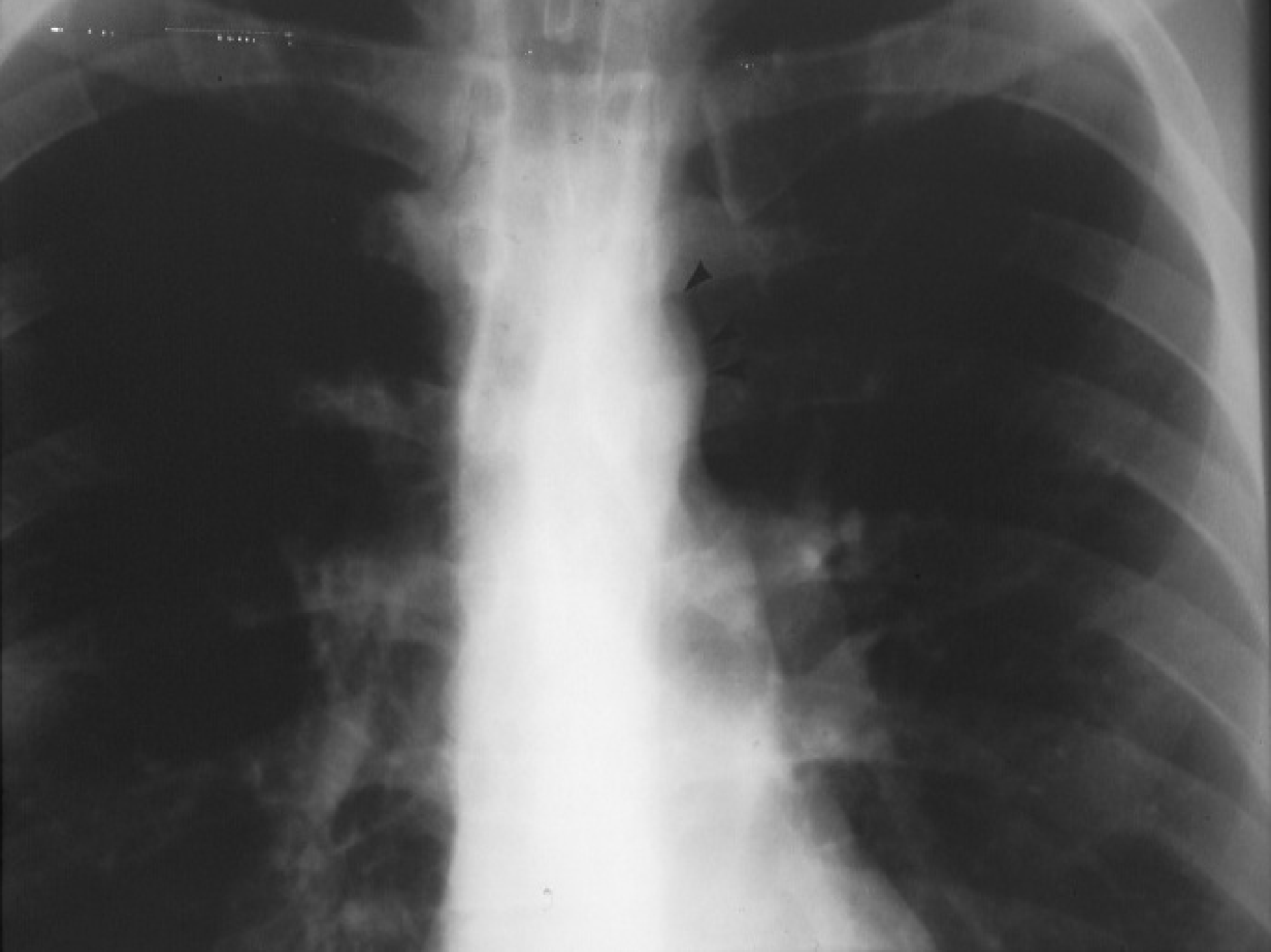


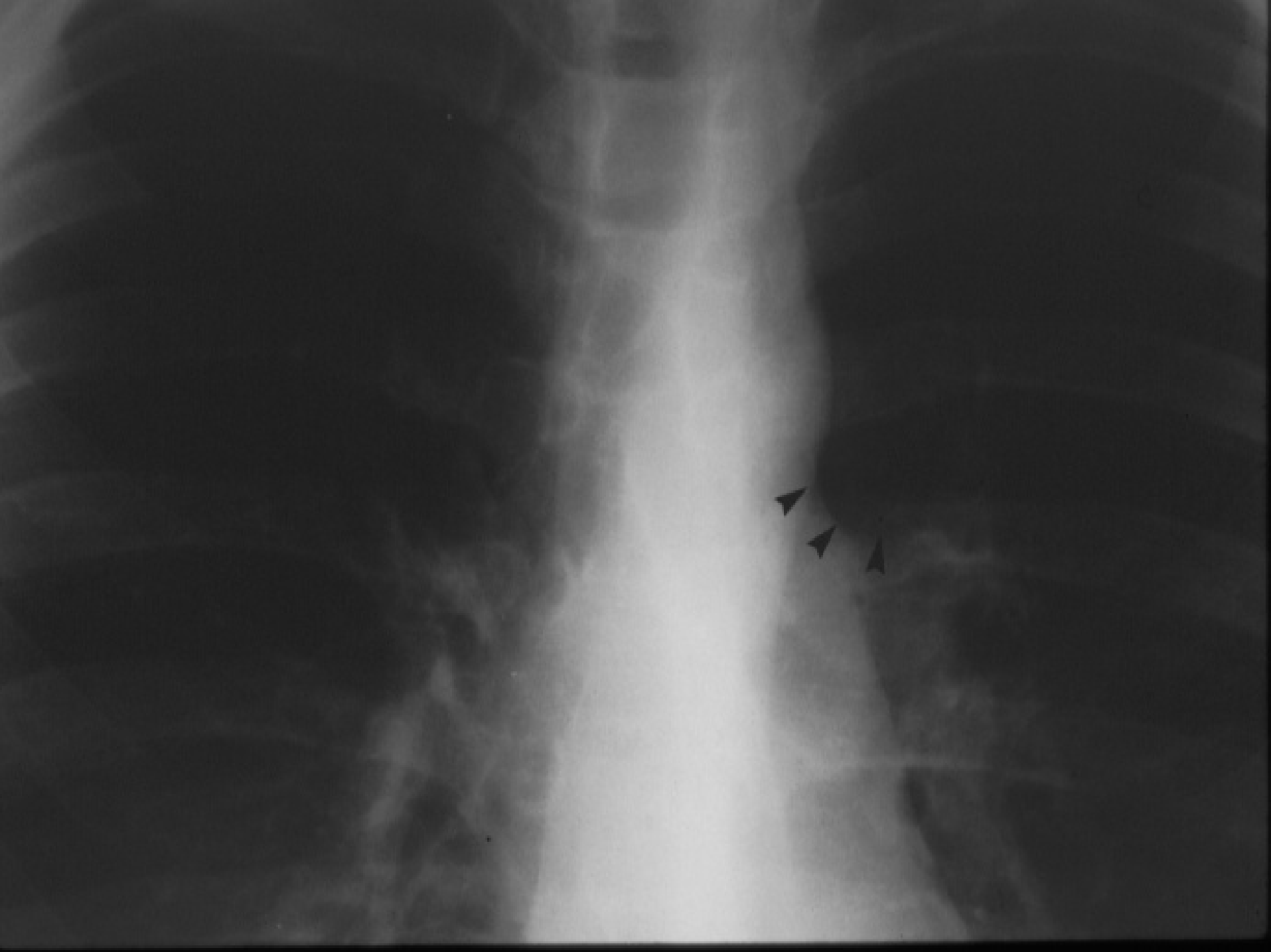






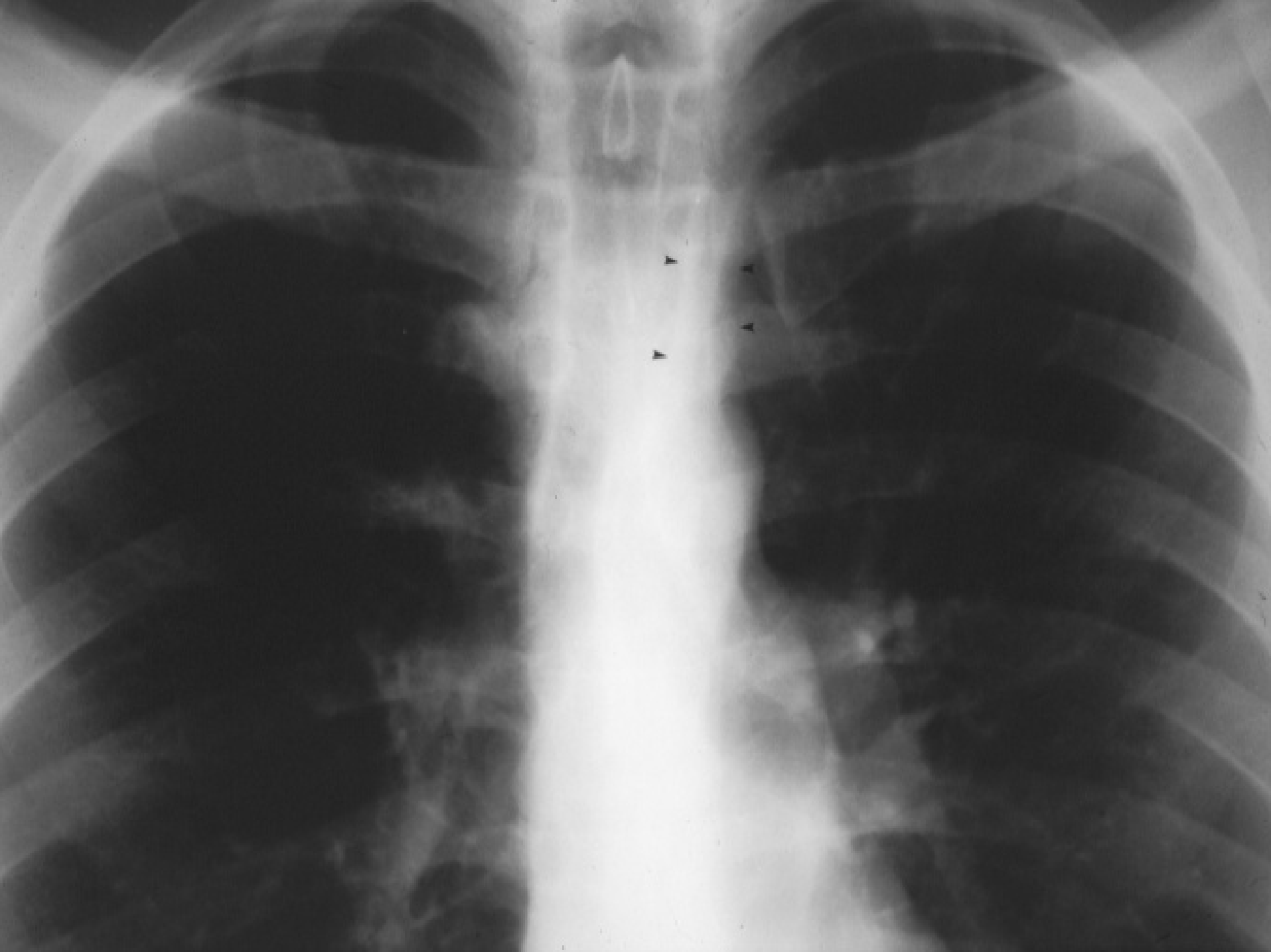


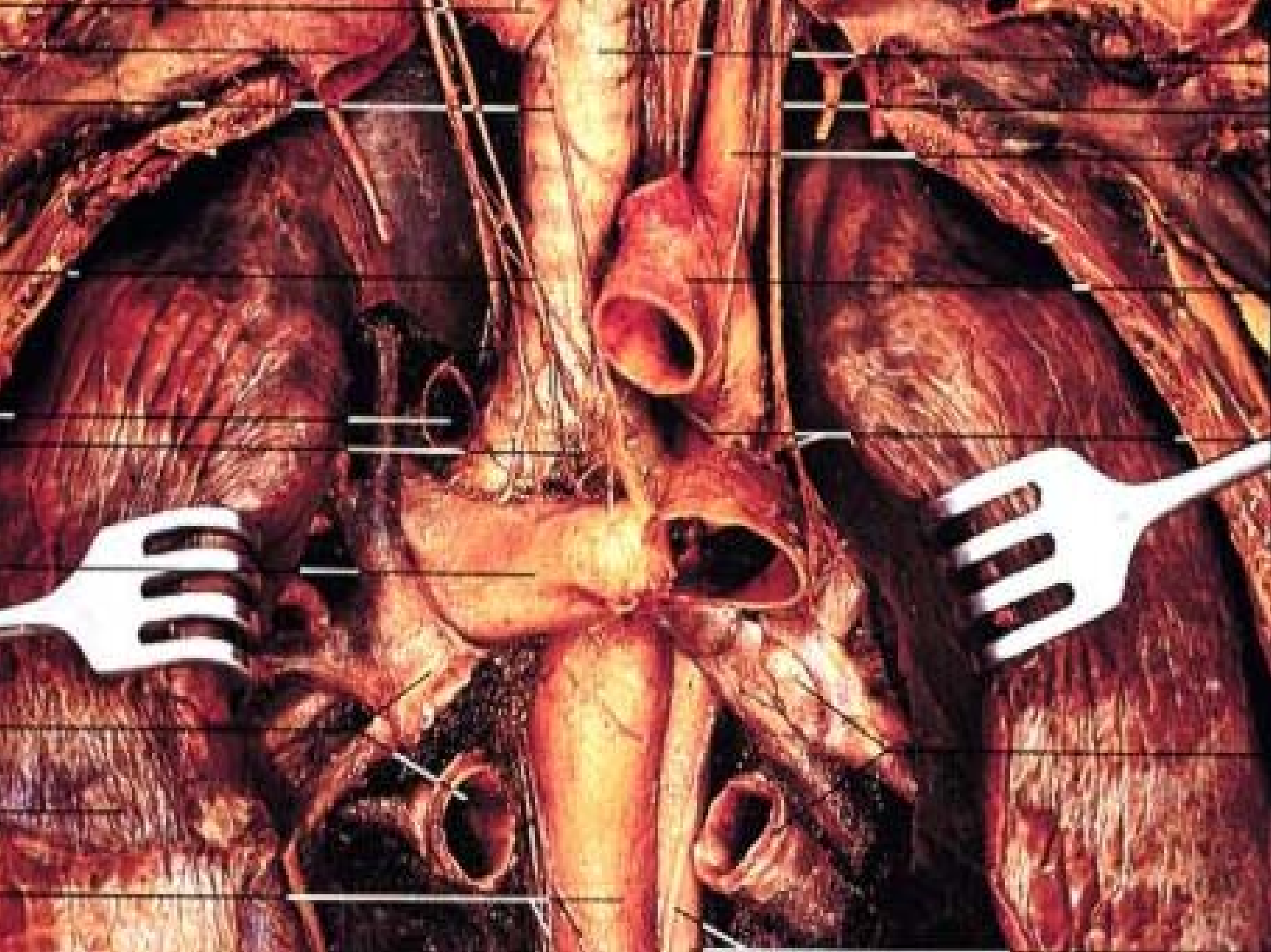


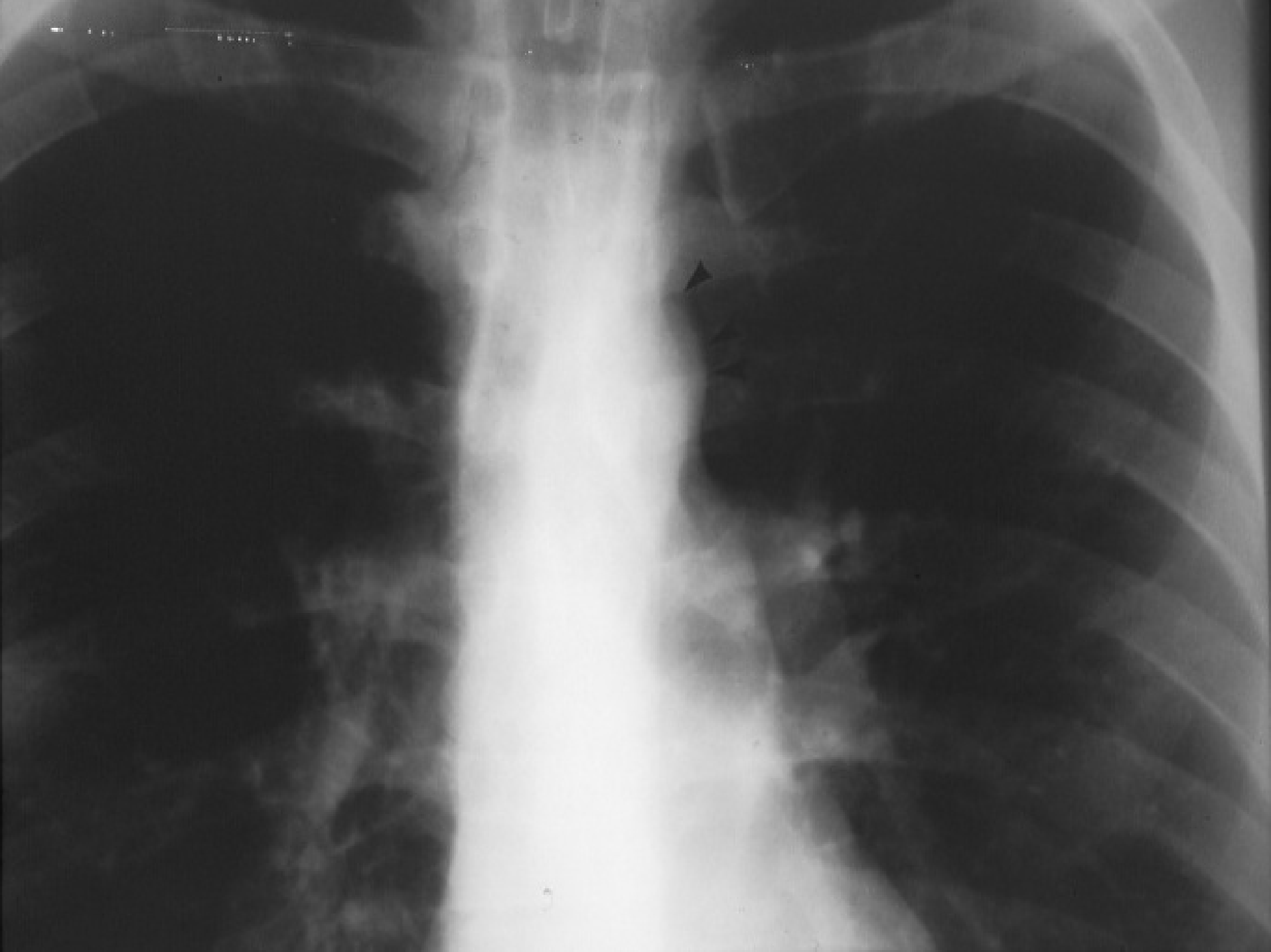


Mediastinum

- Left Paratracheal Edge







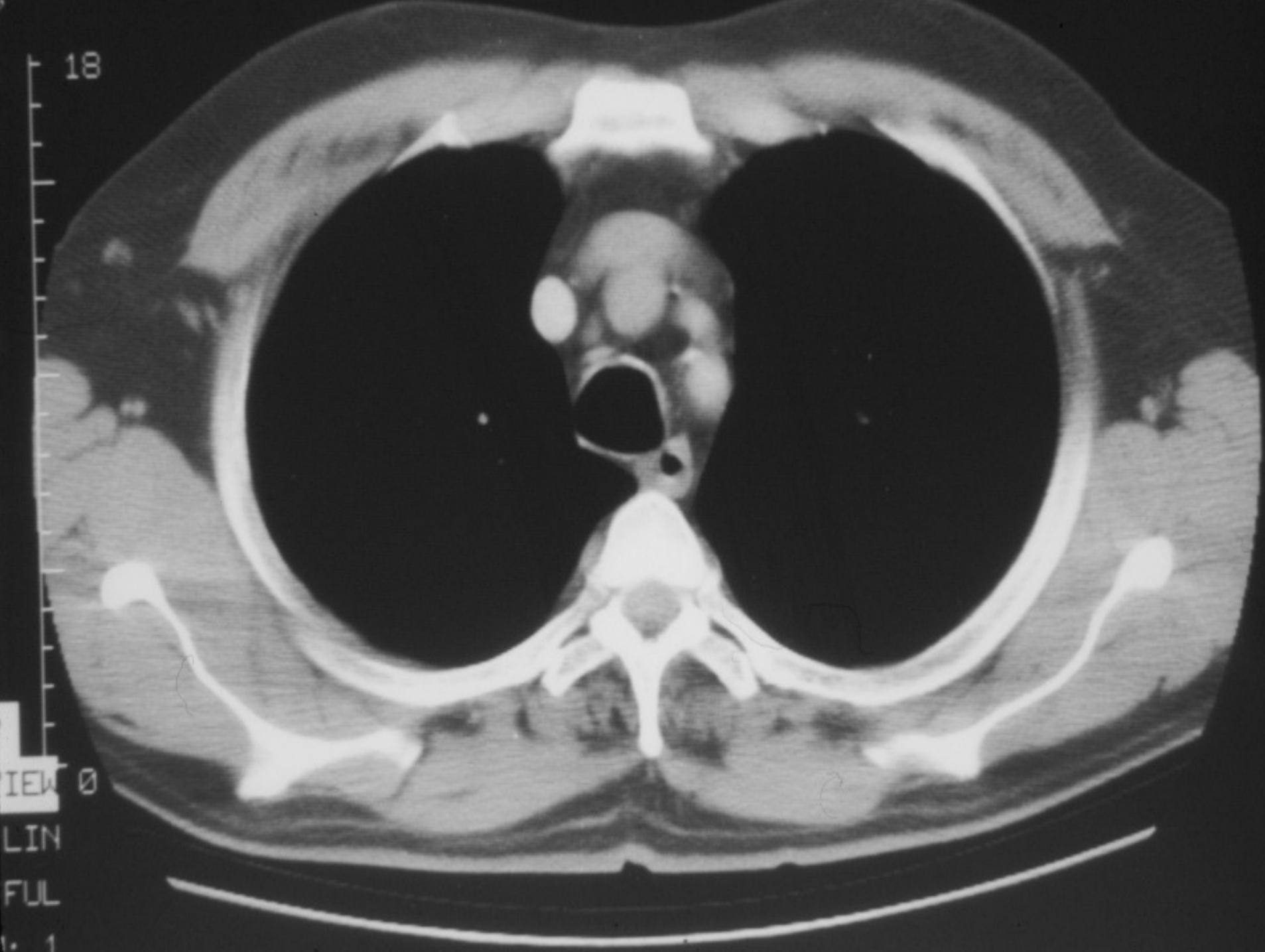
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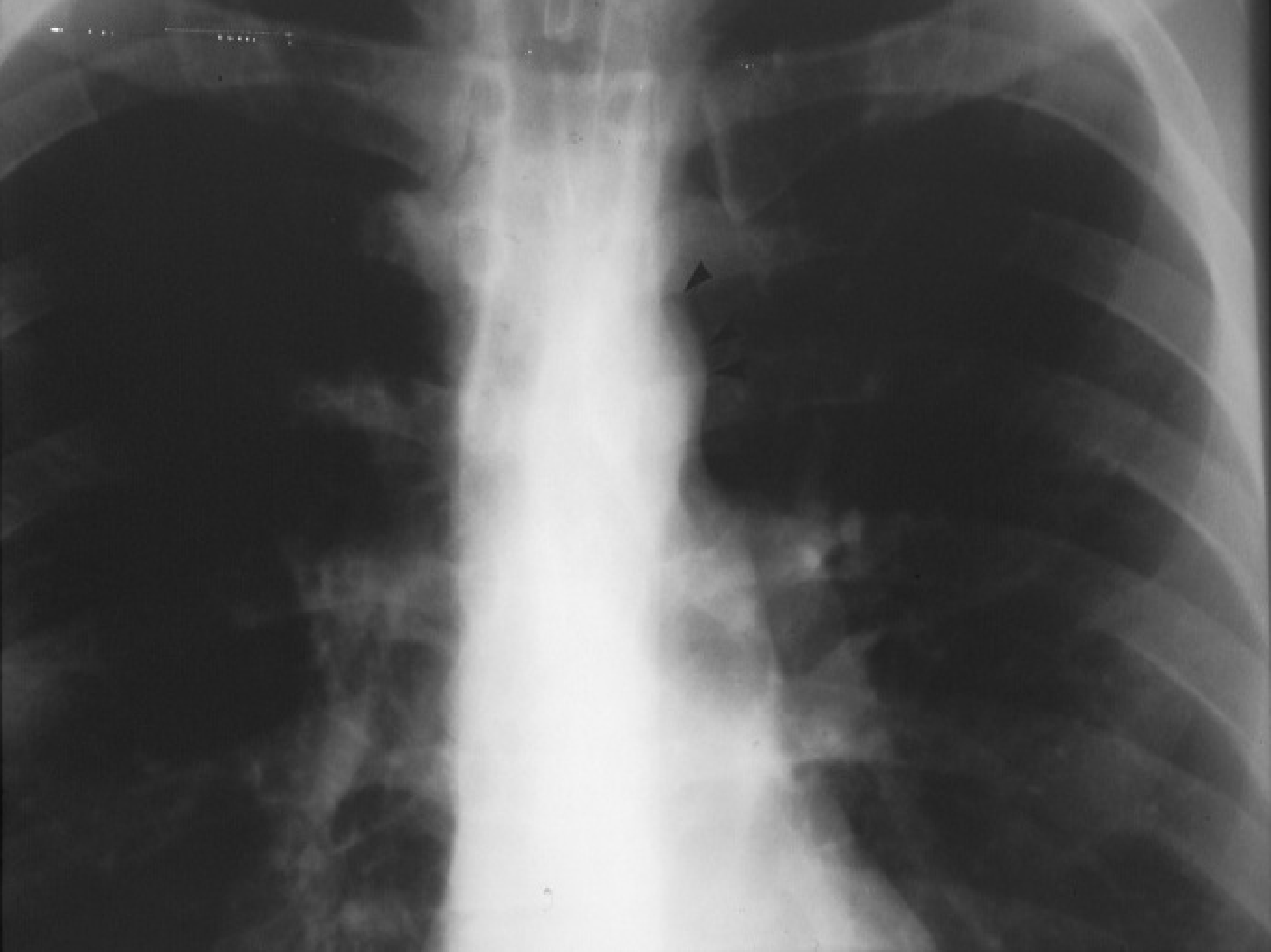
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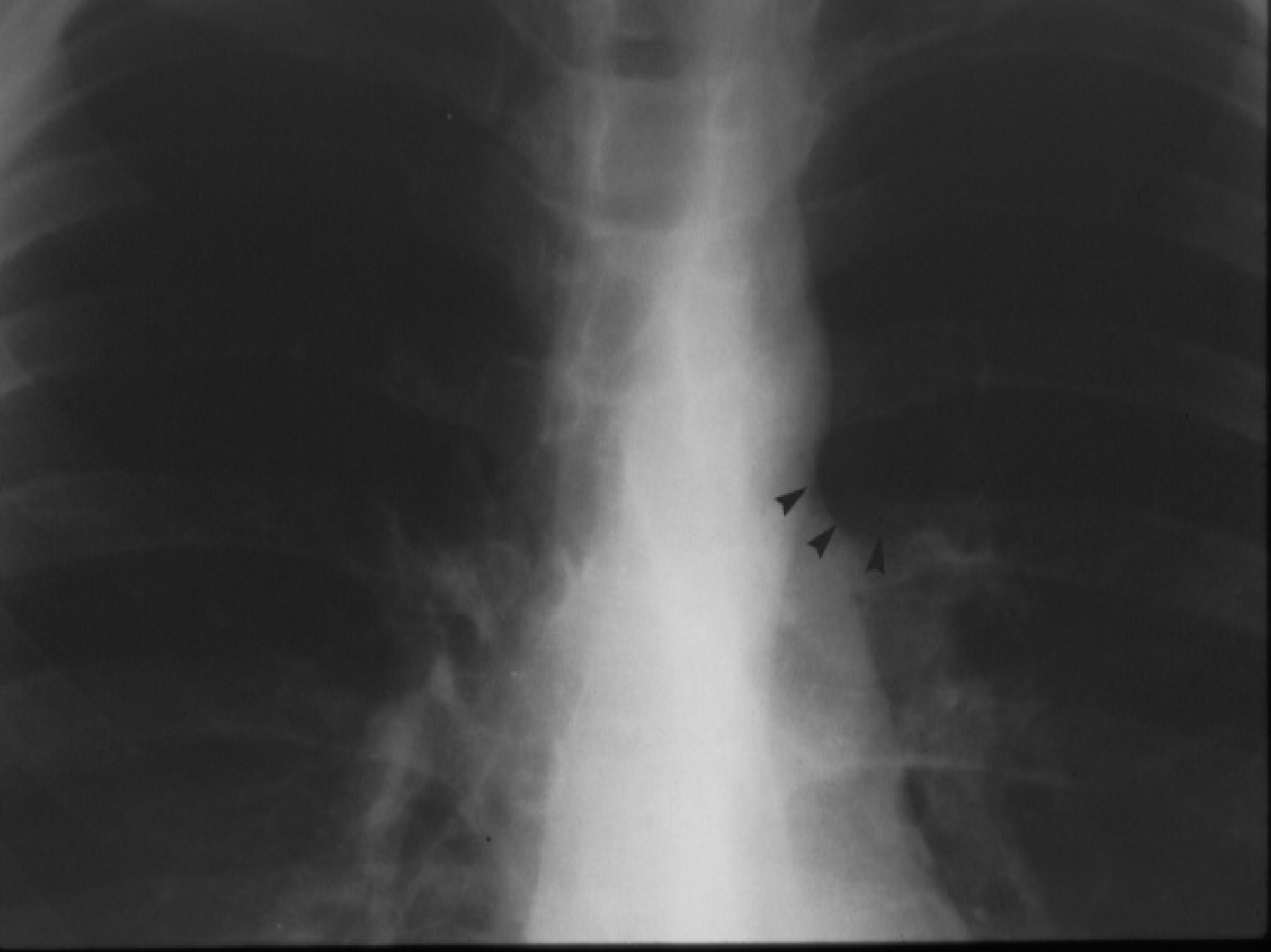
LIN

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Airways

- Trachea
- Carina
- Main Bronchi



Hila

- Left and Right Pulmonary Arteries



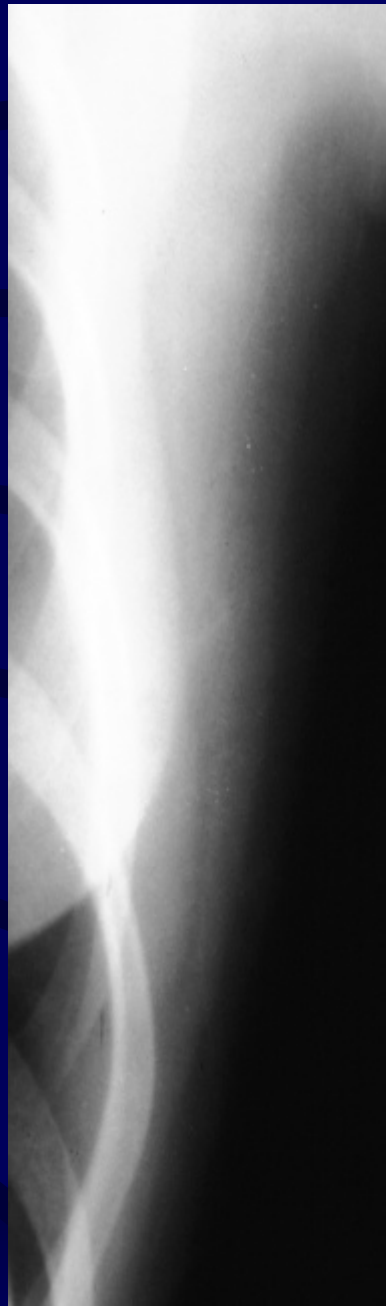
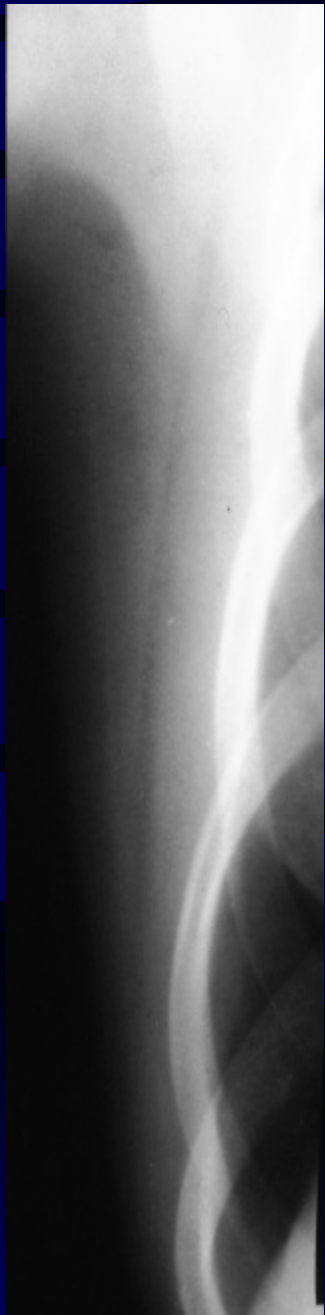


Soft Tissues

- Neck
- Chest walls
- Breast Shadows
- Diaphragms
- Bowel Gas





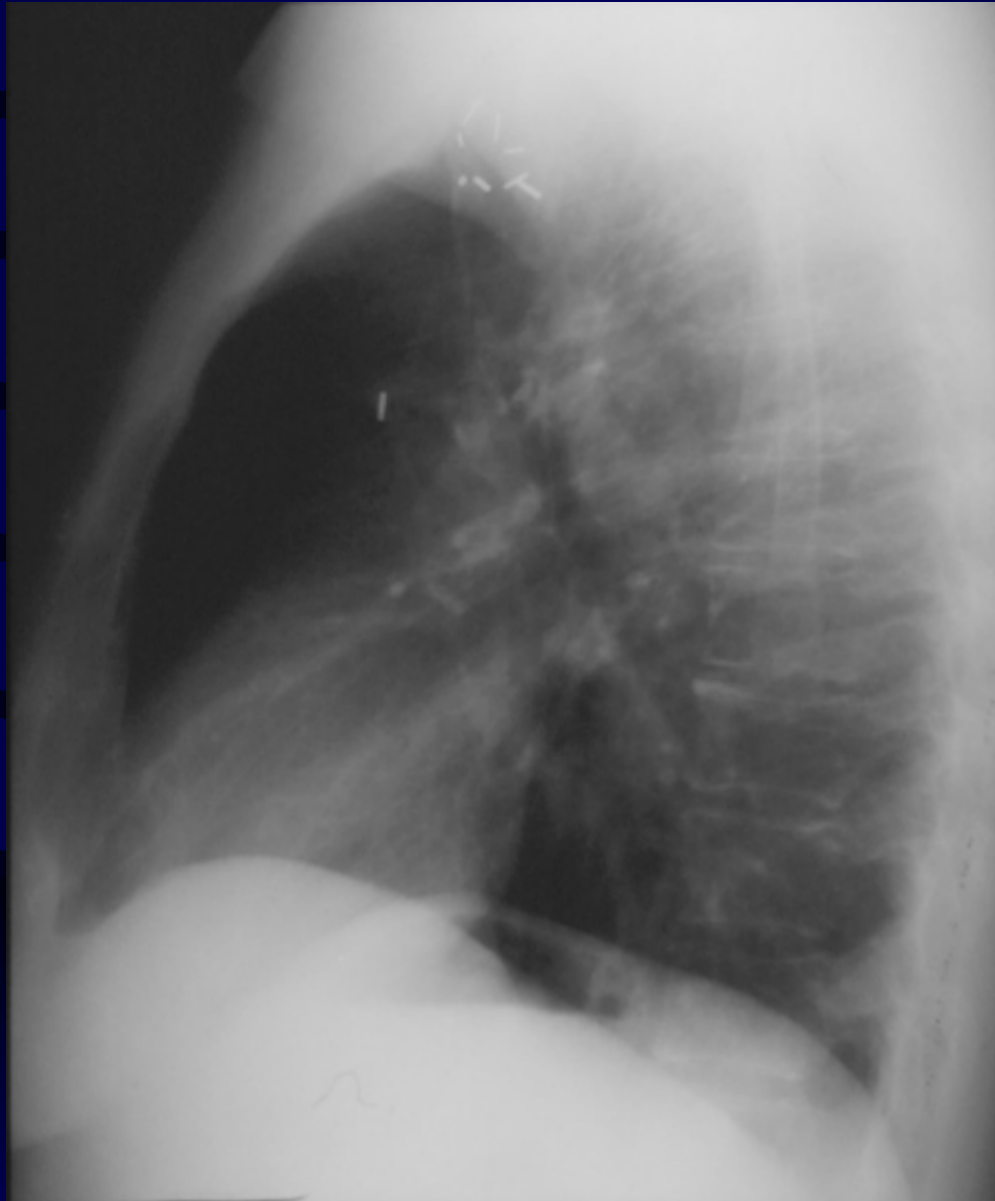








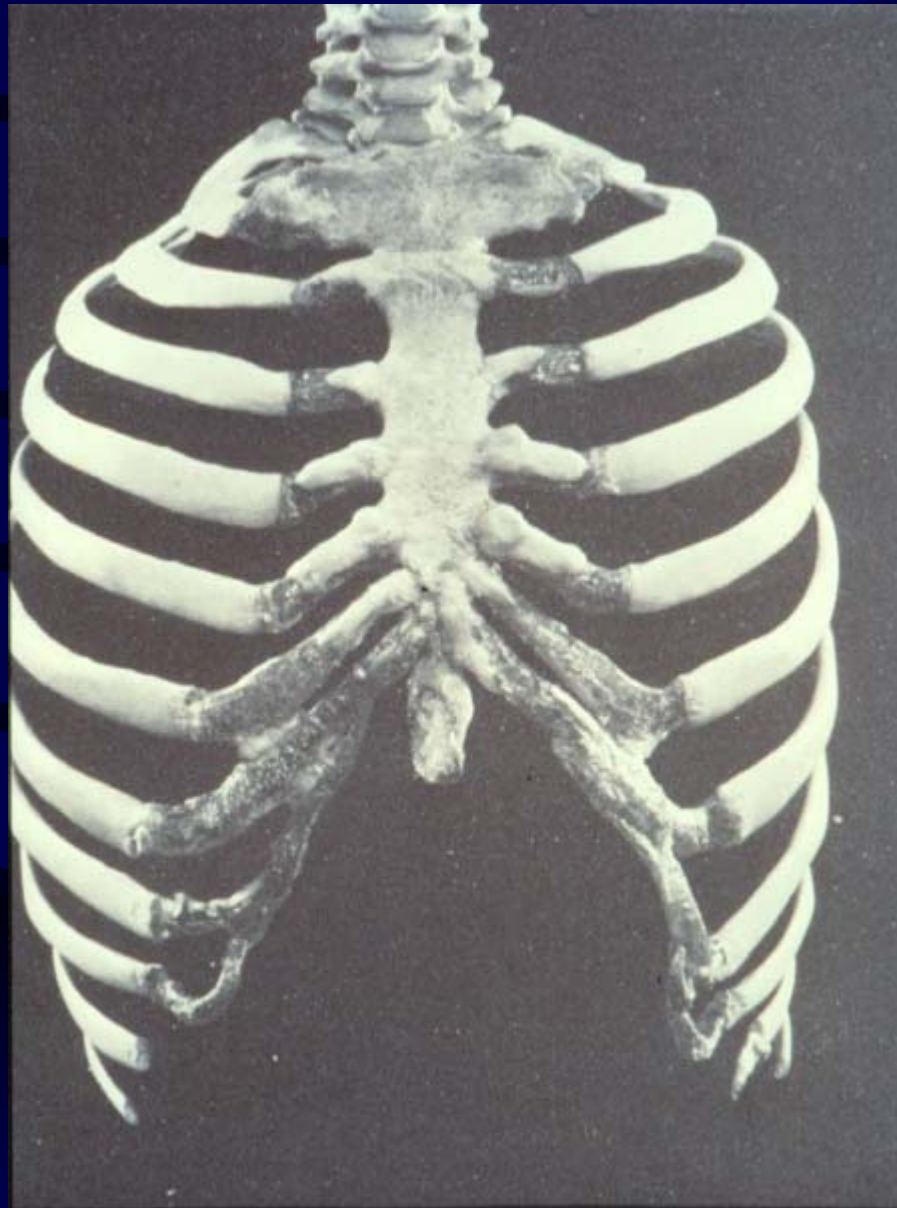


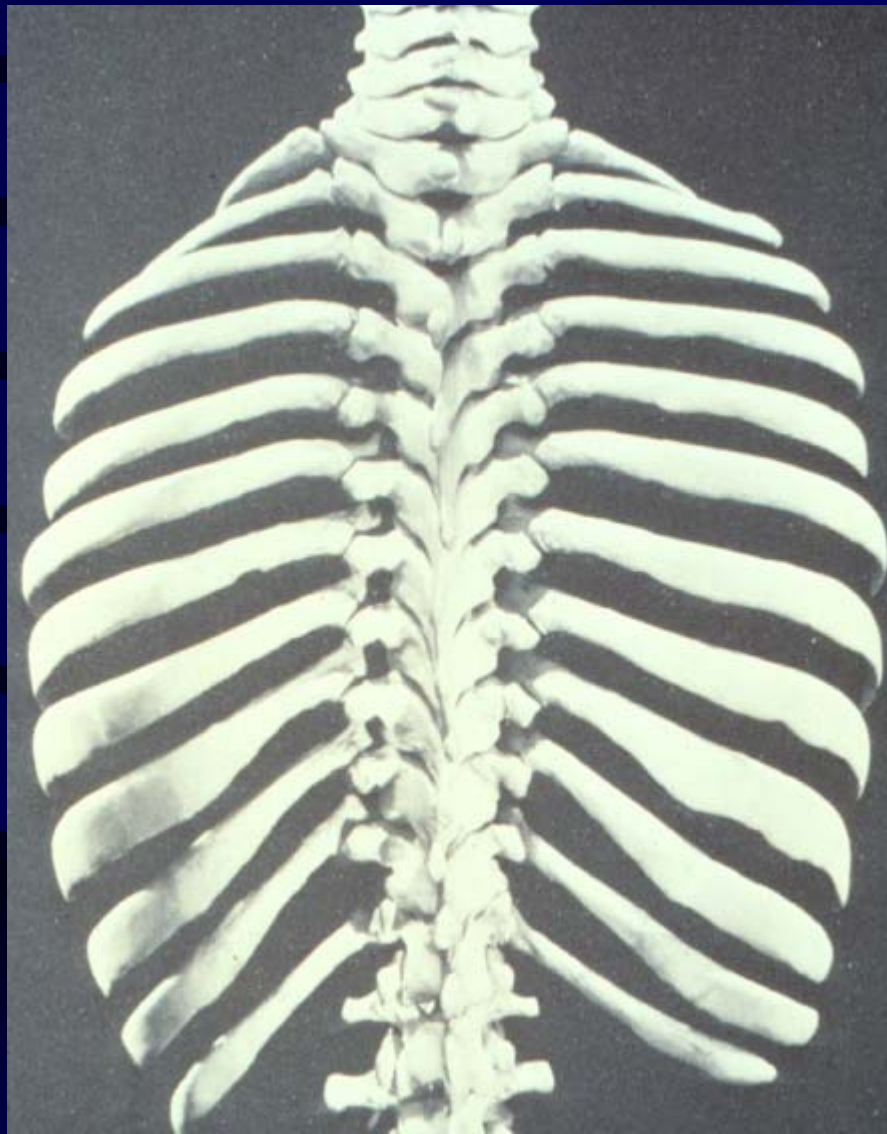


Bones

- Ribs (Anterior and Posterior)
- Clavicles
- Scapulae
- Humeri
- Spine
 - Bodies and Disc Spaces
 - Spinous processes
 - Pedicles

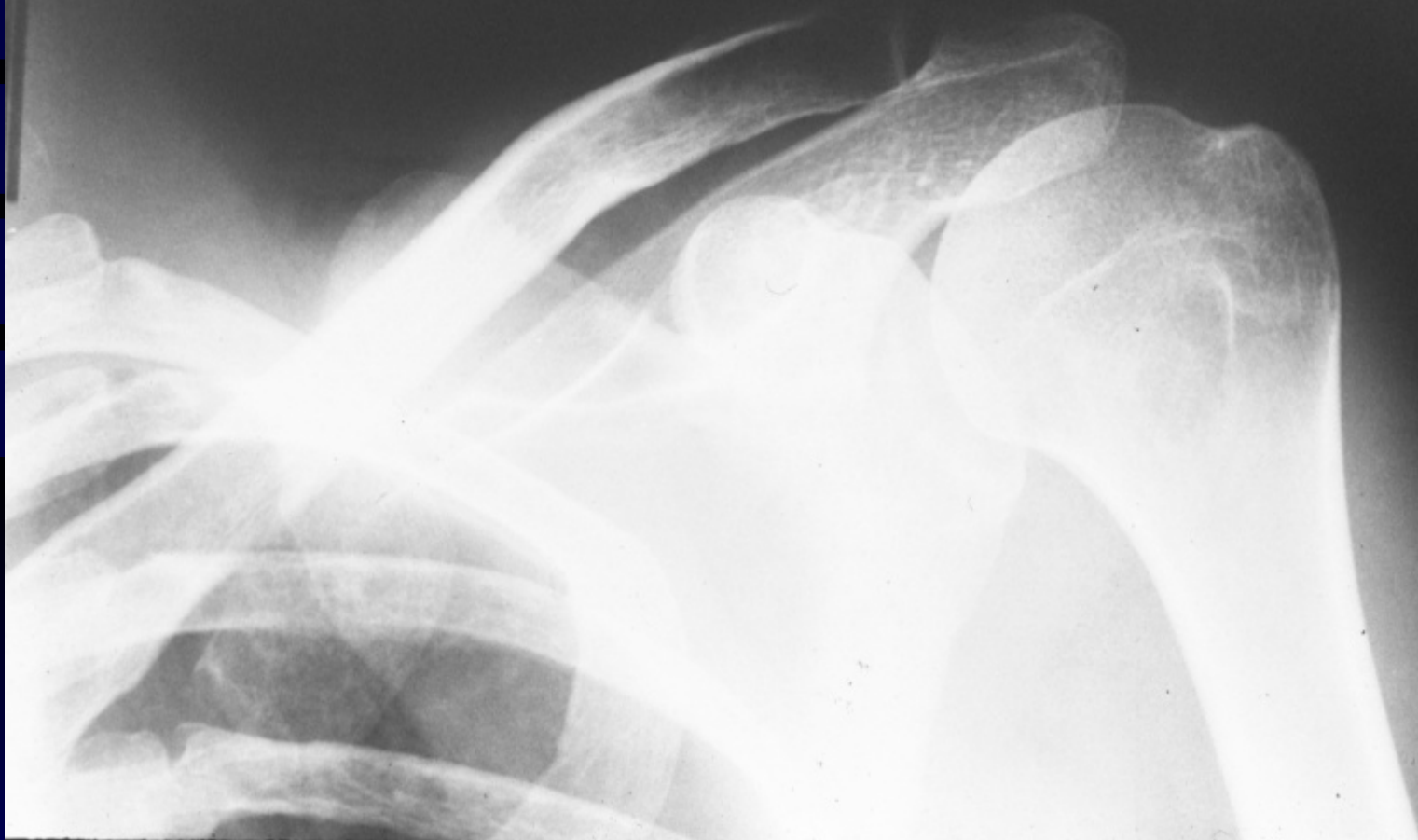


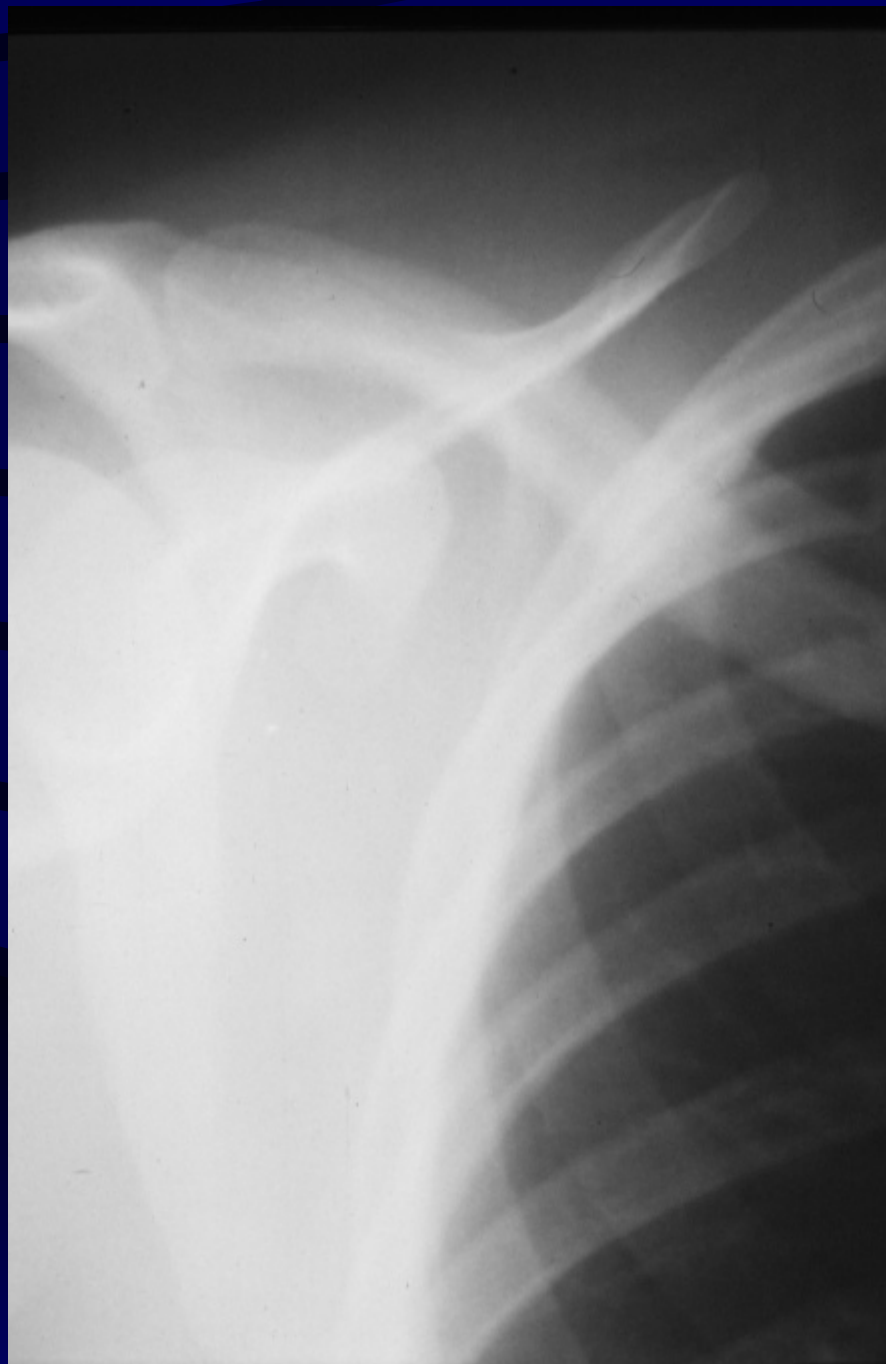


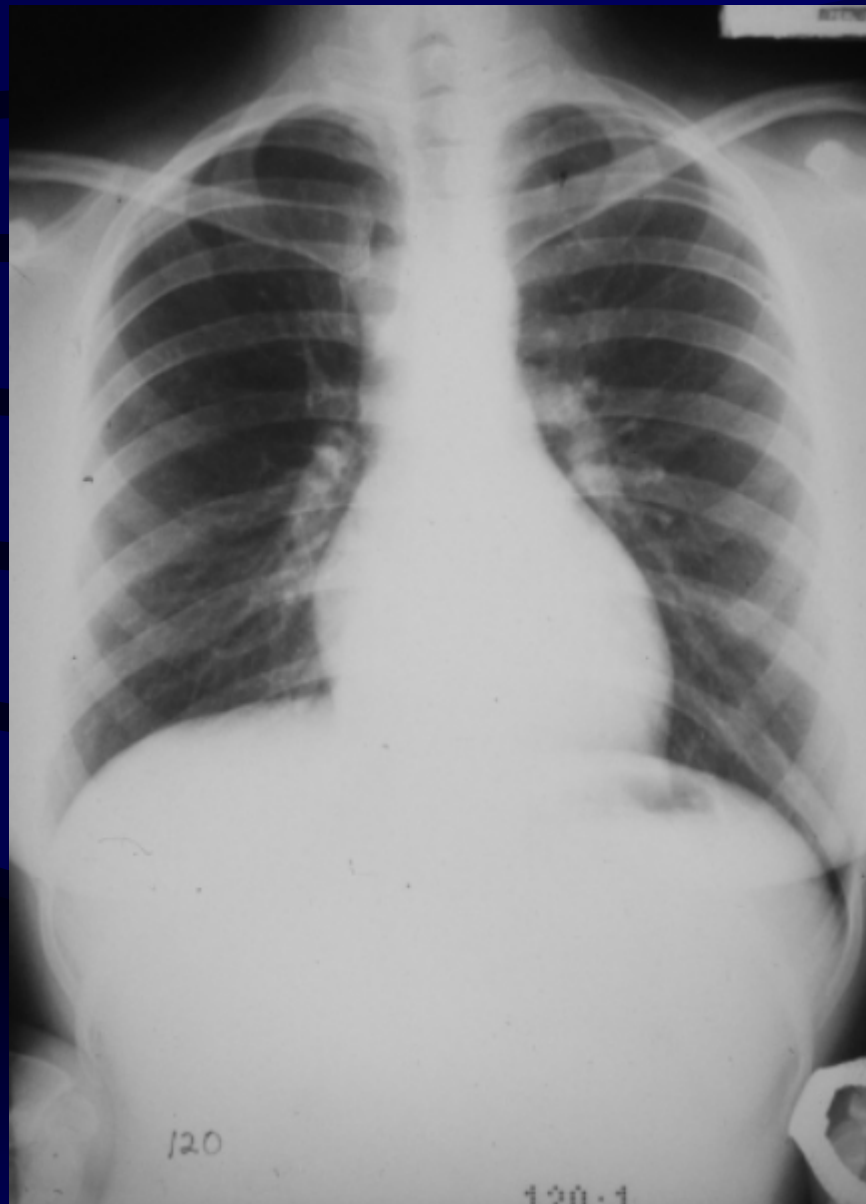


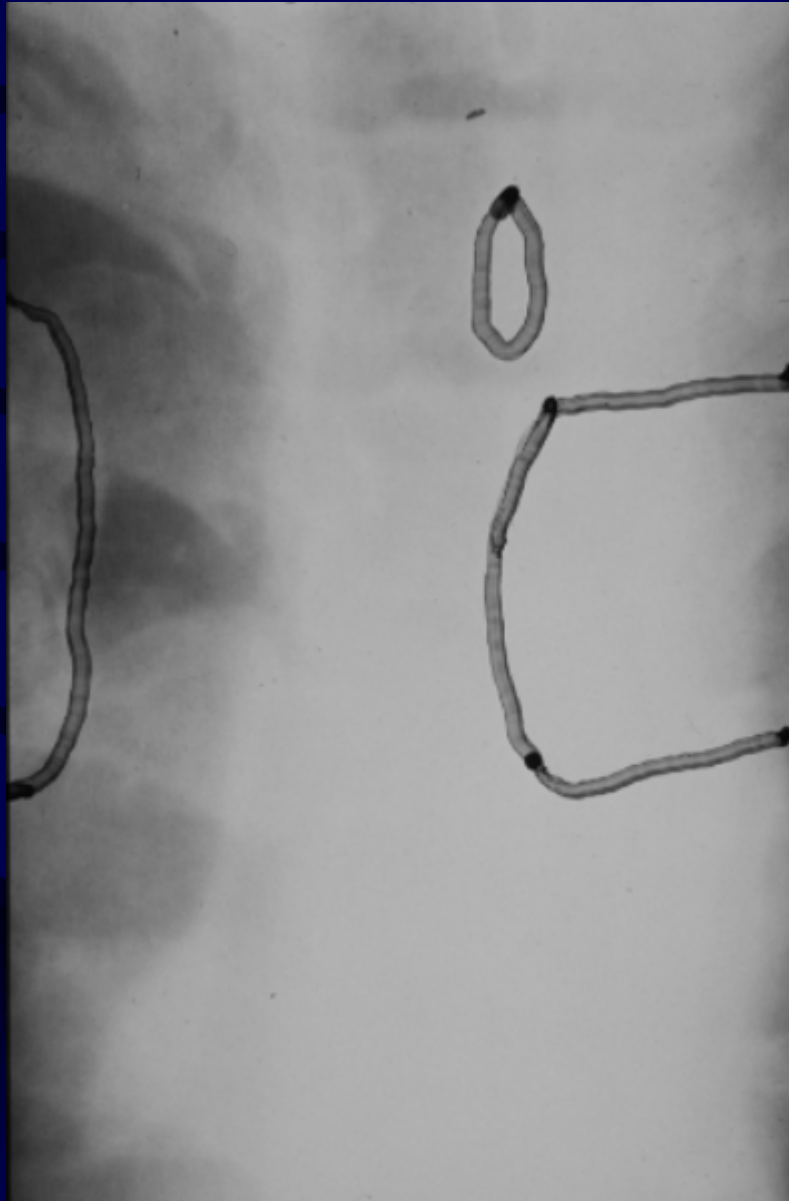
EXTERNAL

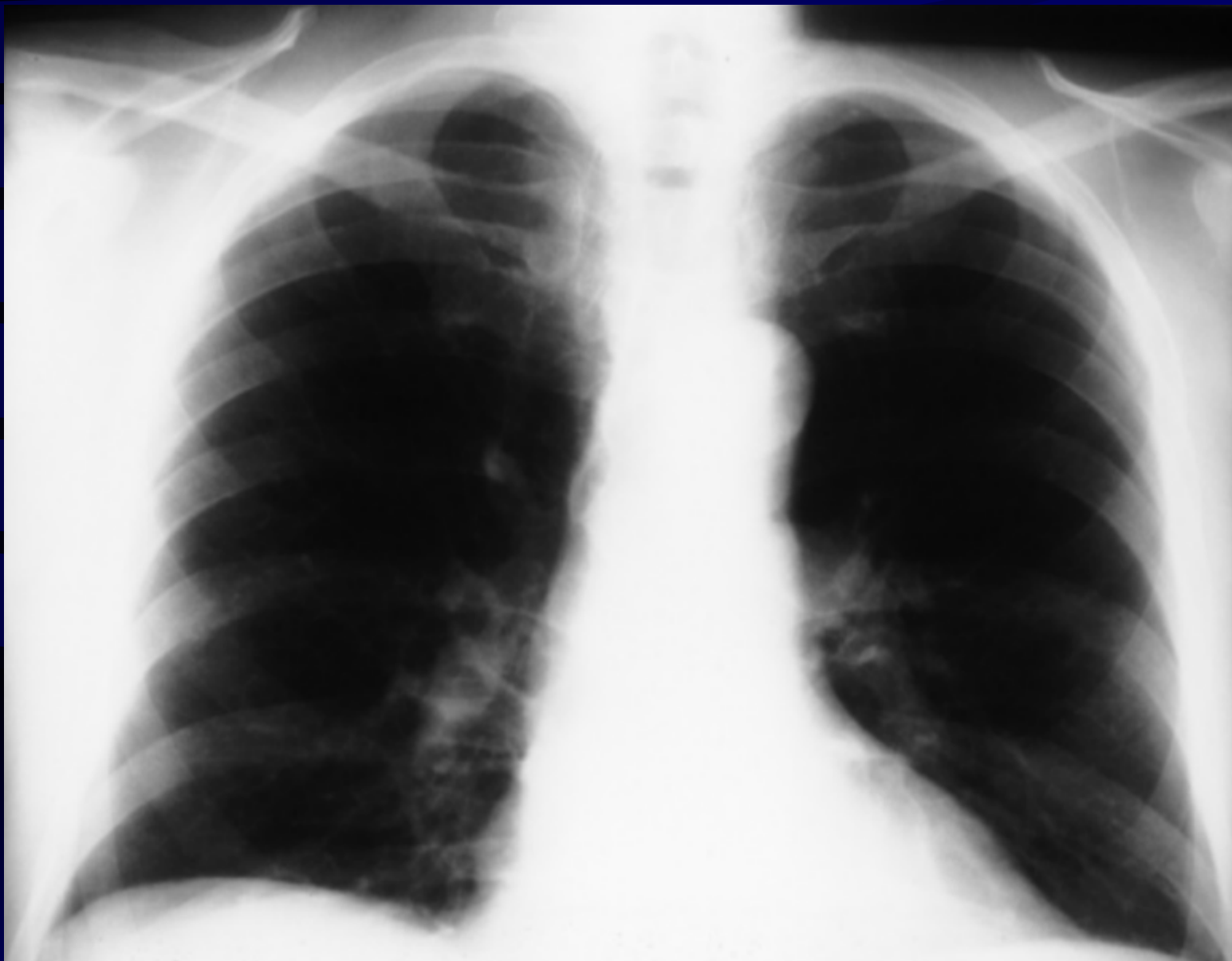
LEFT-9

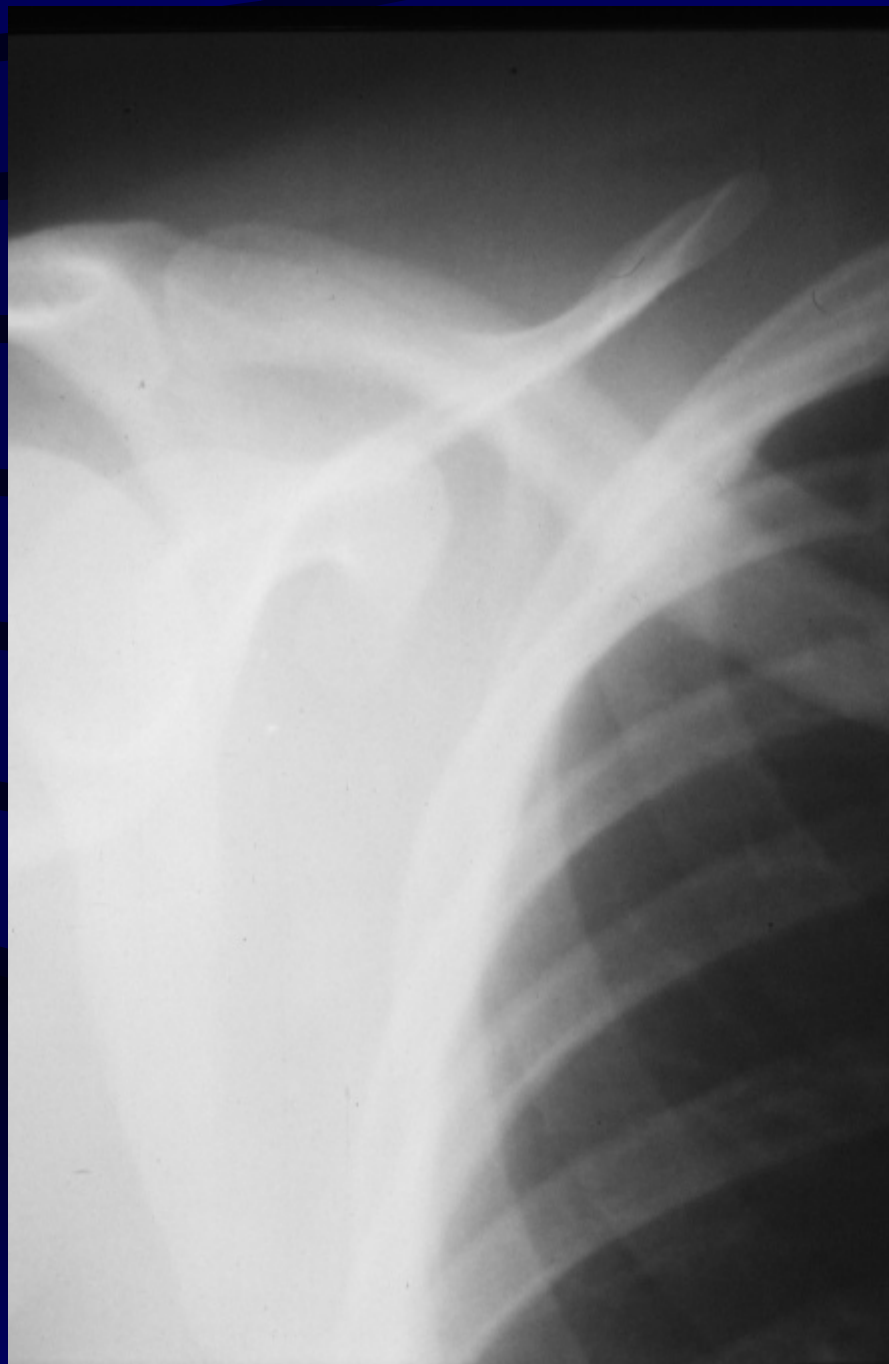






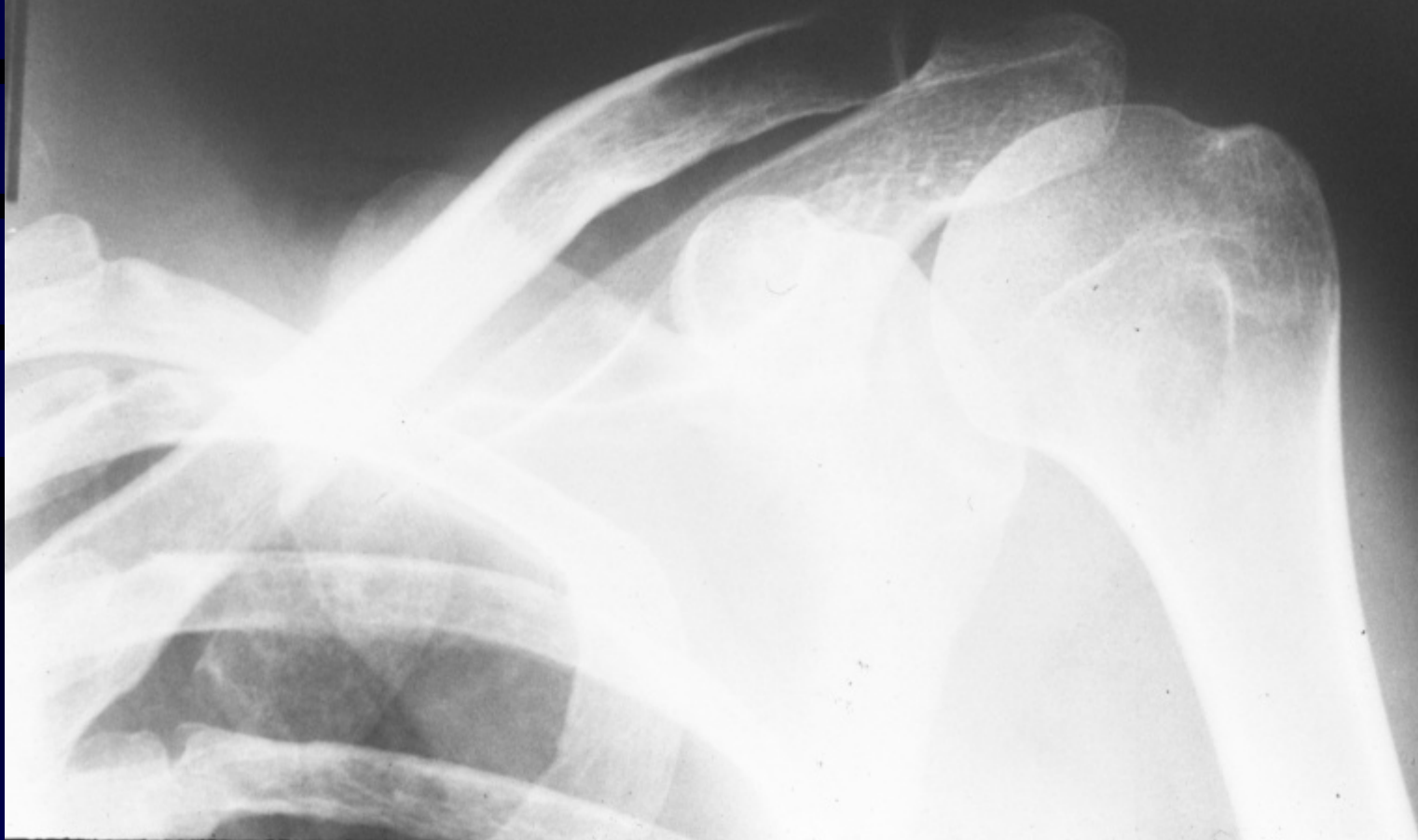




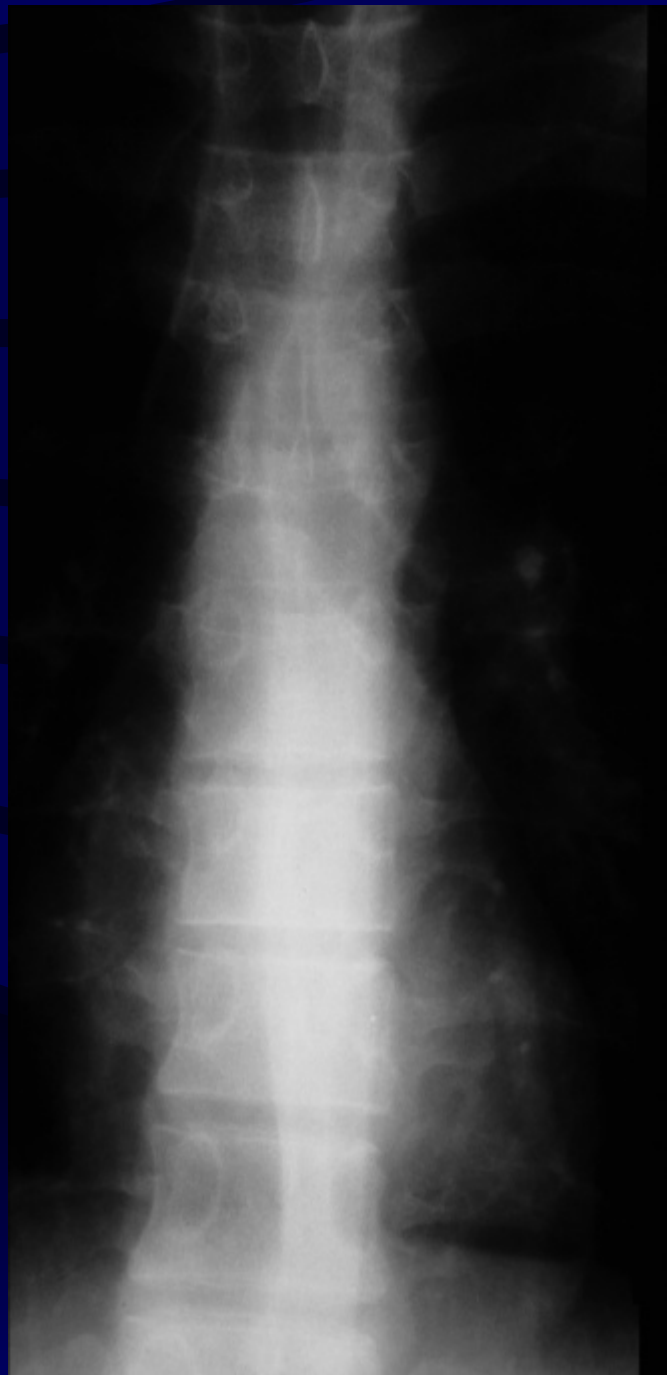


EXTERNAL

LEFT-9

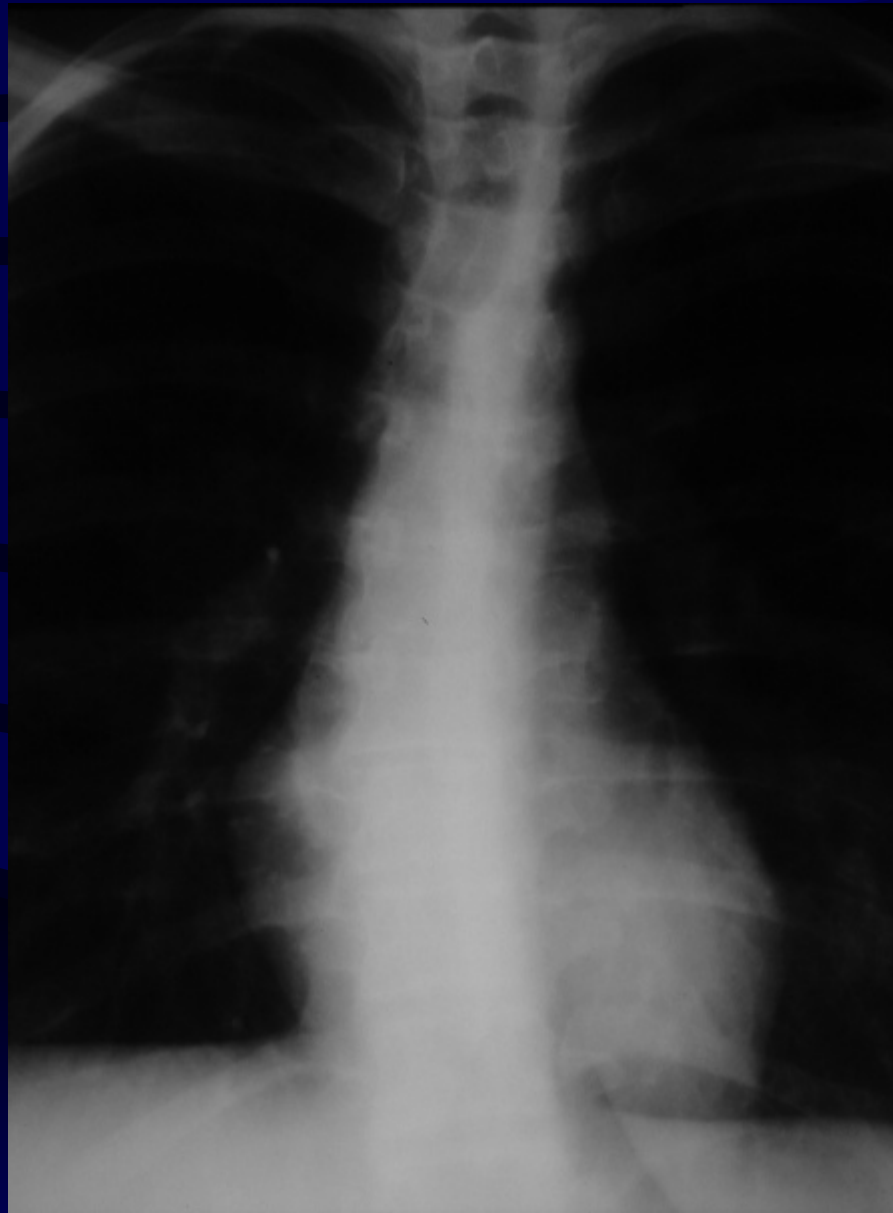






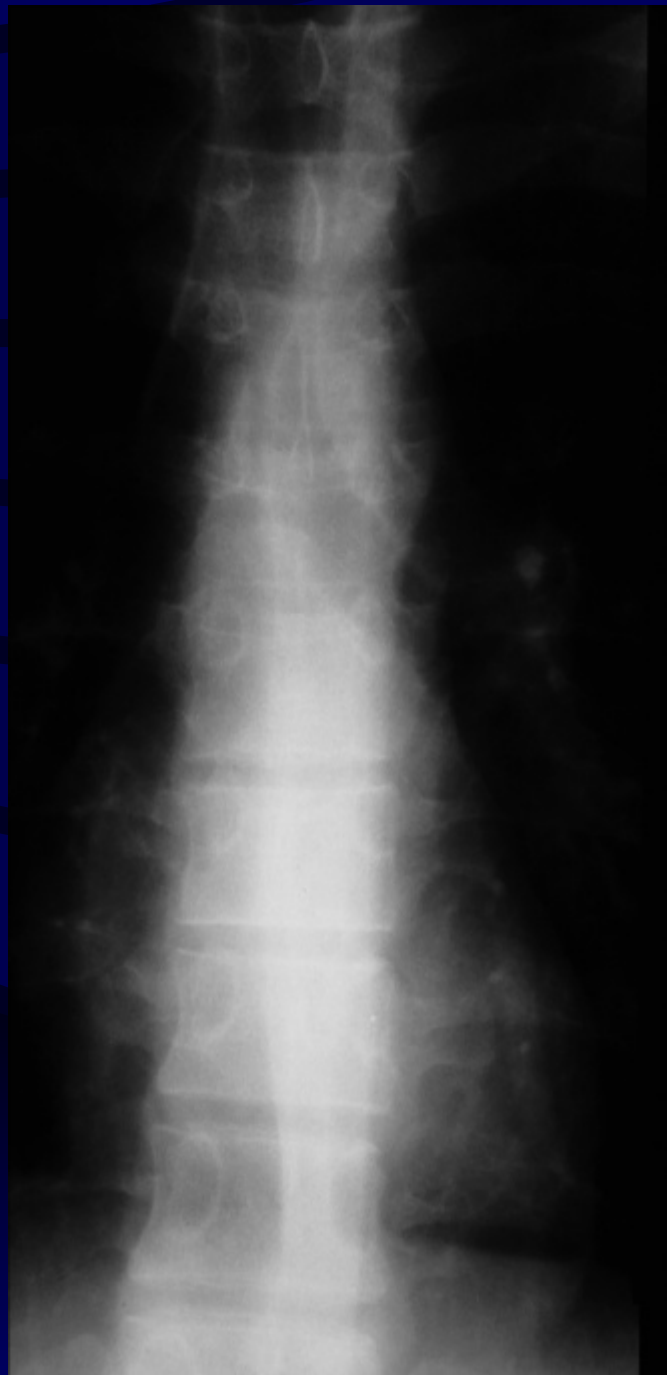


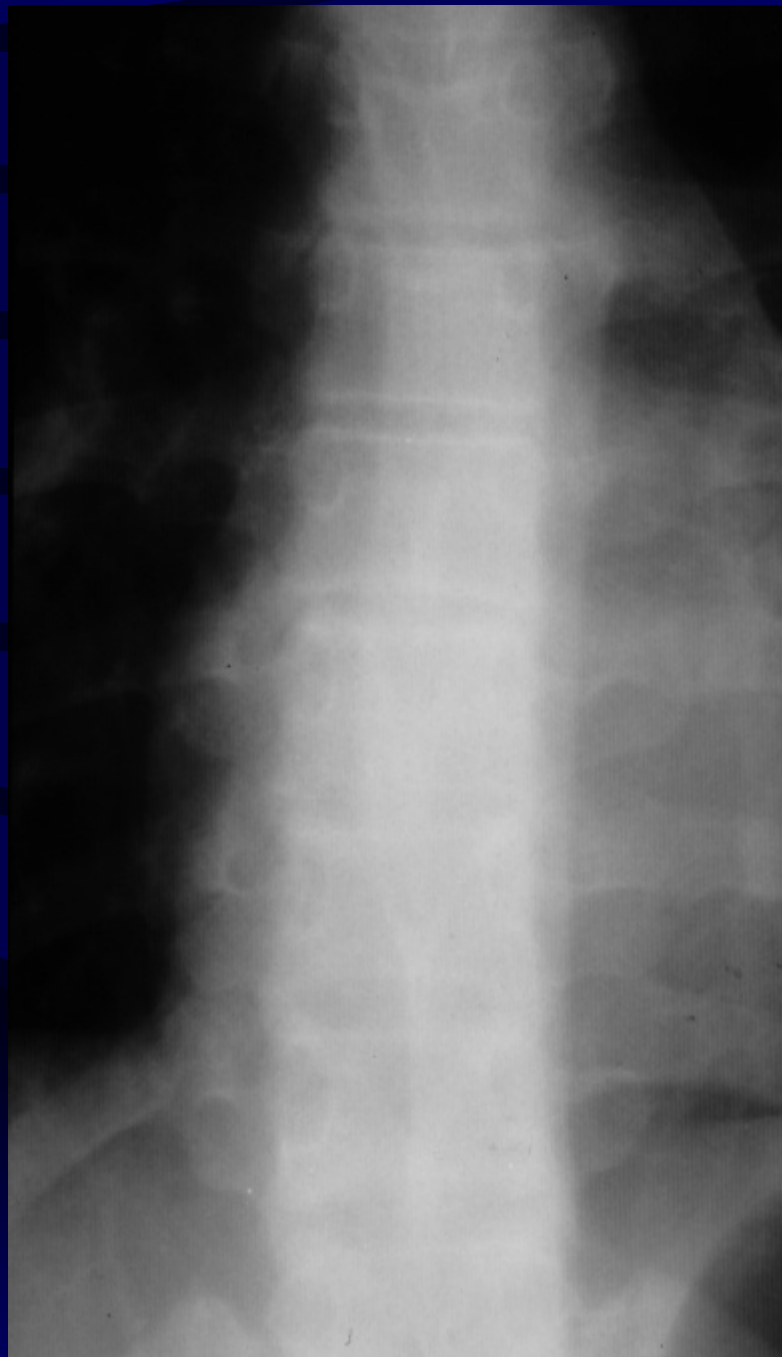


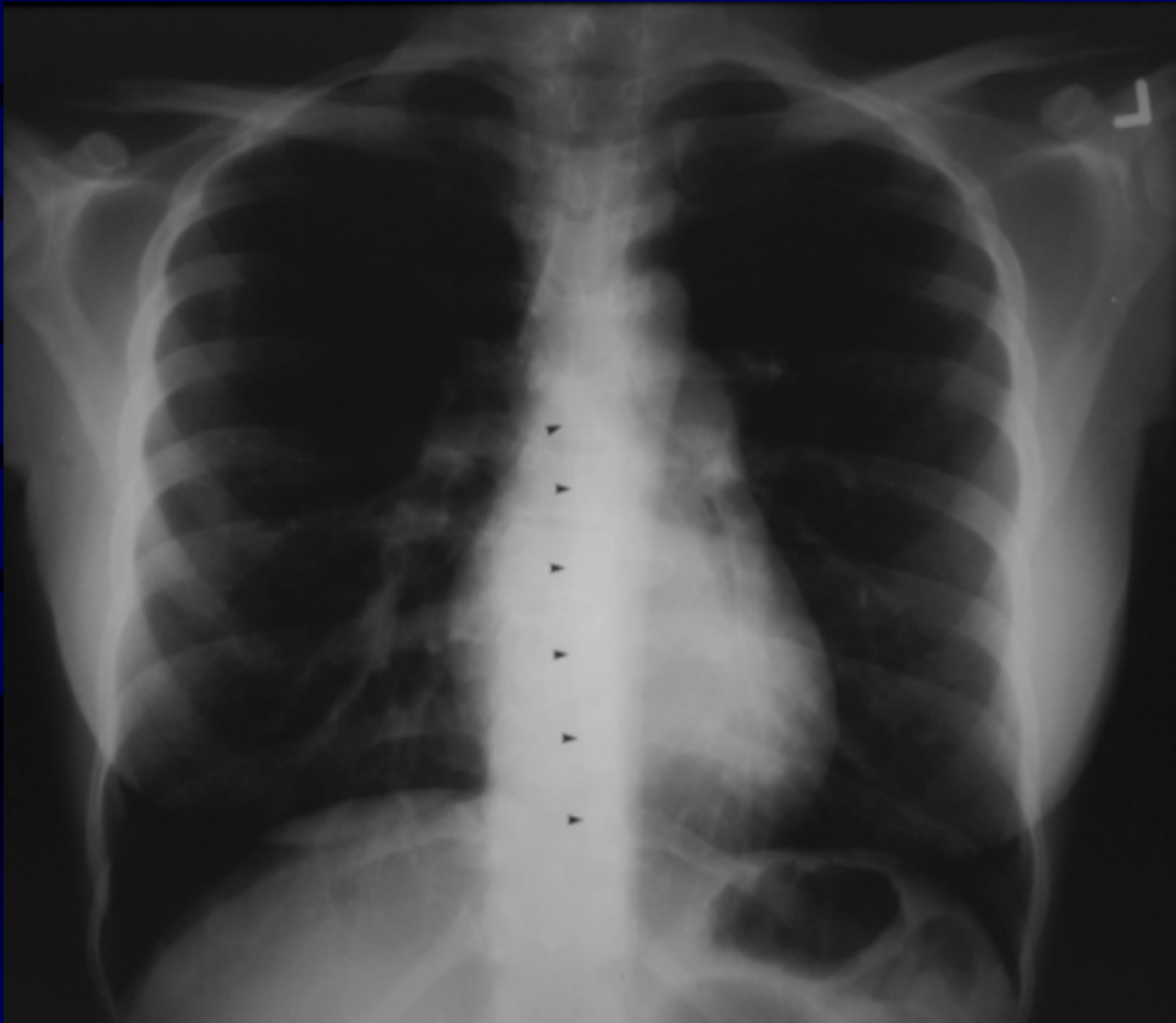


Optional Structure

- Azygo-esophageal edge
 - indentation of right lower lobe
 - between heart and spine
 - nearest mediastinal structures are azygous vein and esophagus







SN 1117.7

Im:15 +C

MAY 10, 2000

512

DFOV 32.0cm

LUNG

R
1
7
2

L
1
4
8

R

L

kV 120

mA 280



SN I117.7

Im:15 +C

MAY 10, 2000

512

DFOV 32.0cm

STND

R
1
7
2

L
1
4
8

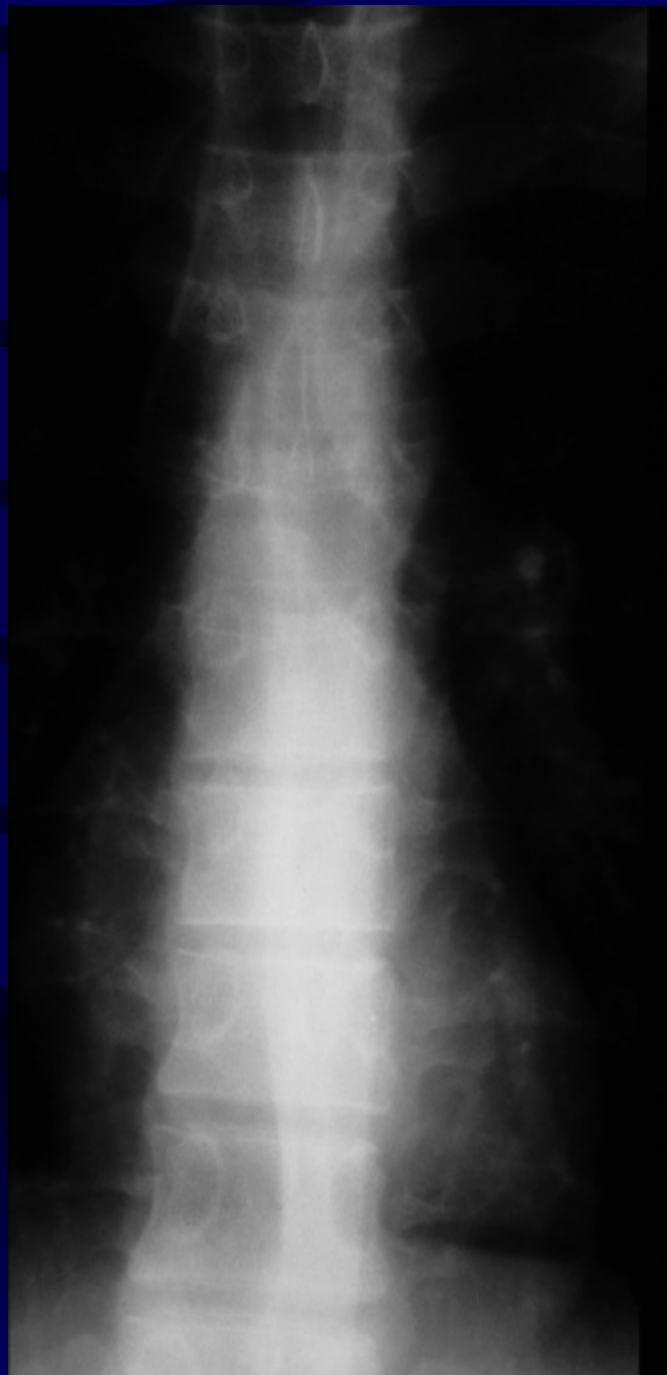
R

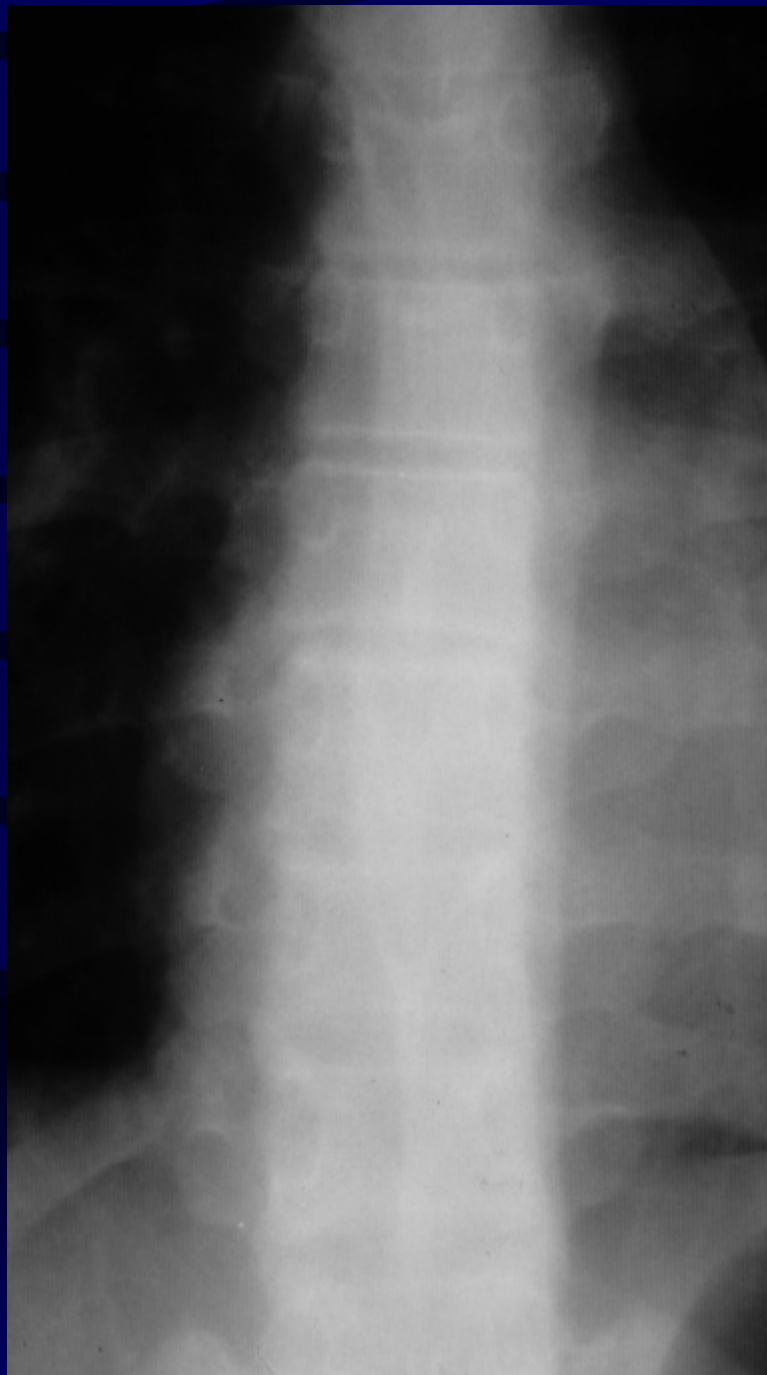
L

kV 120

mA 280

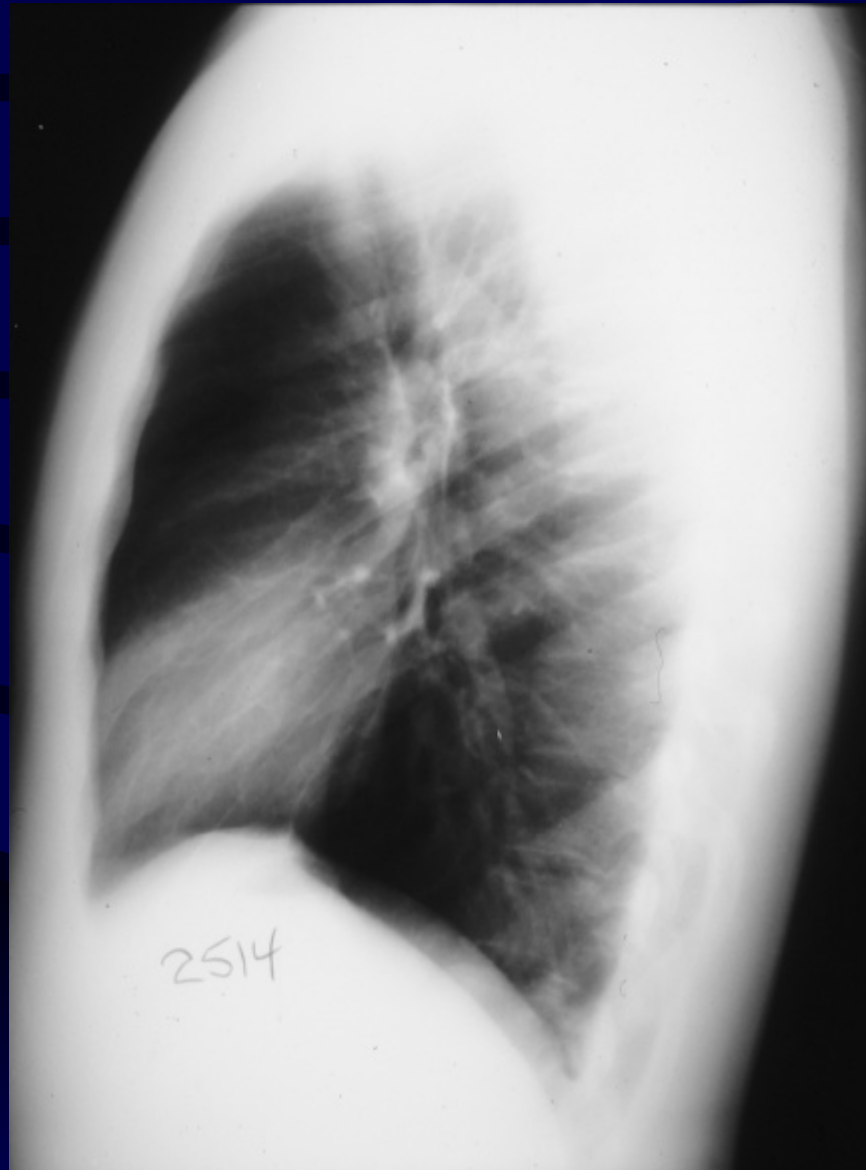


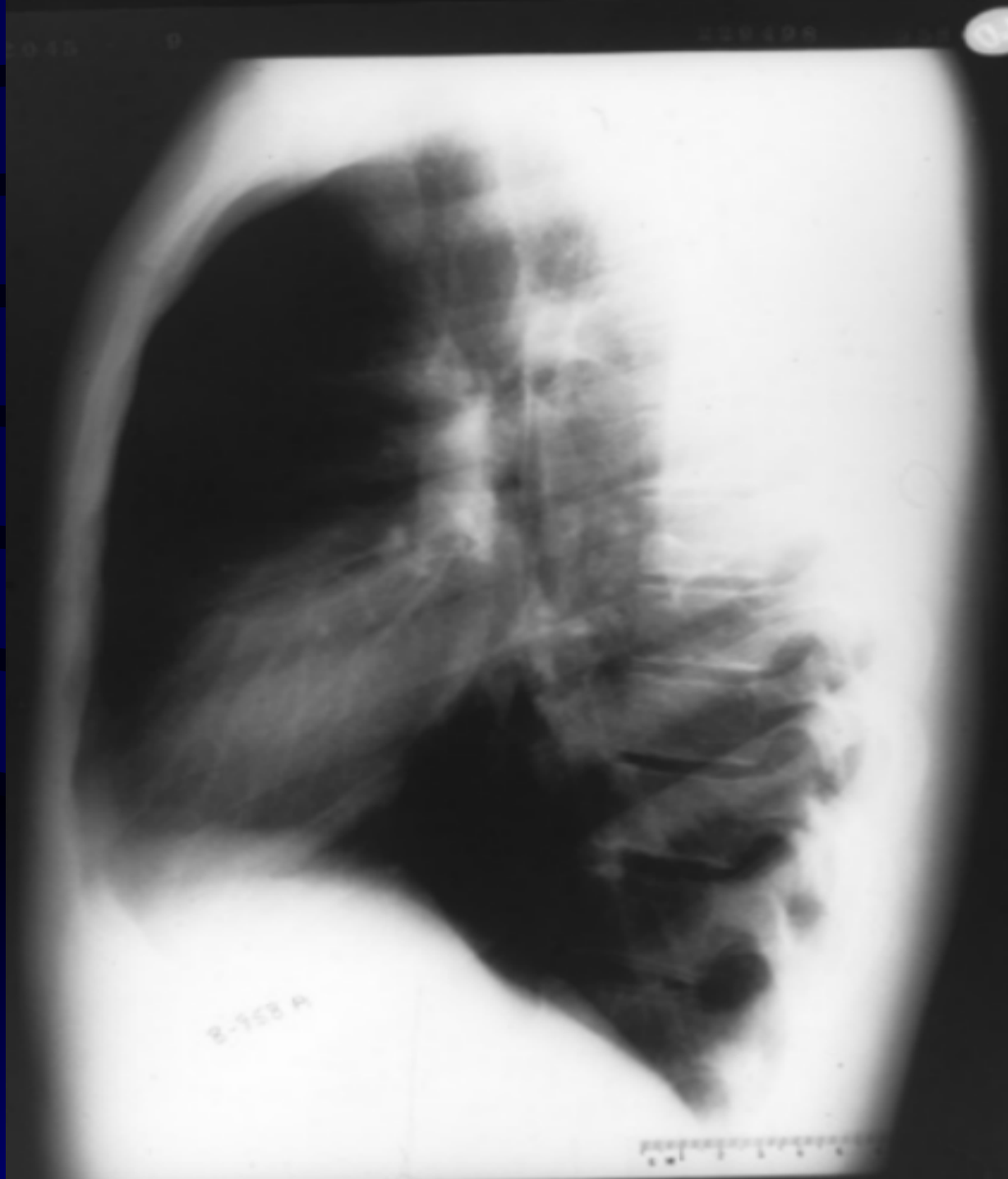




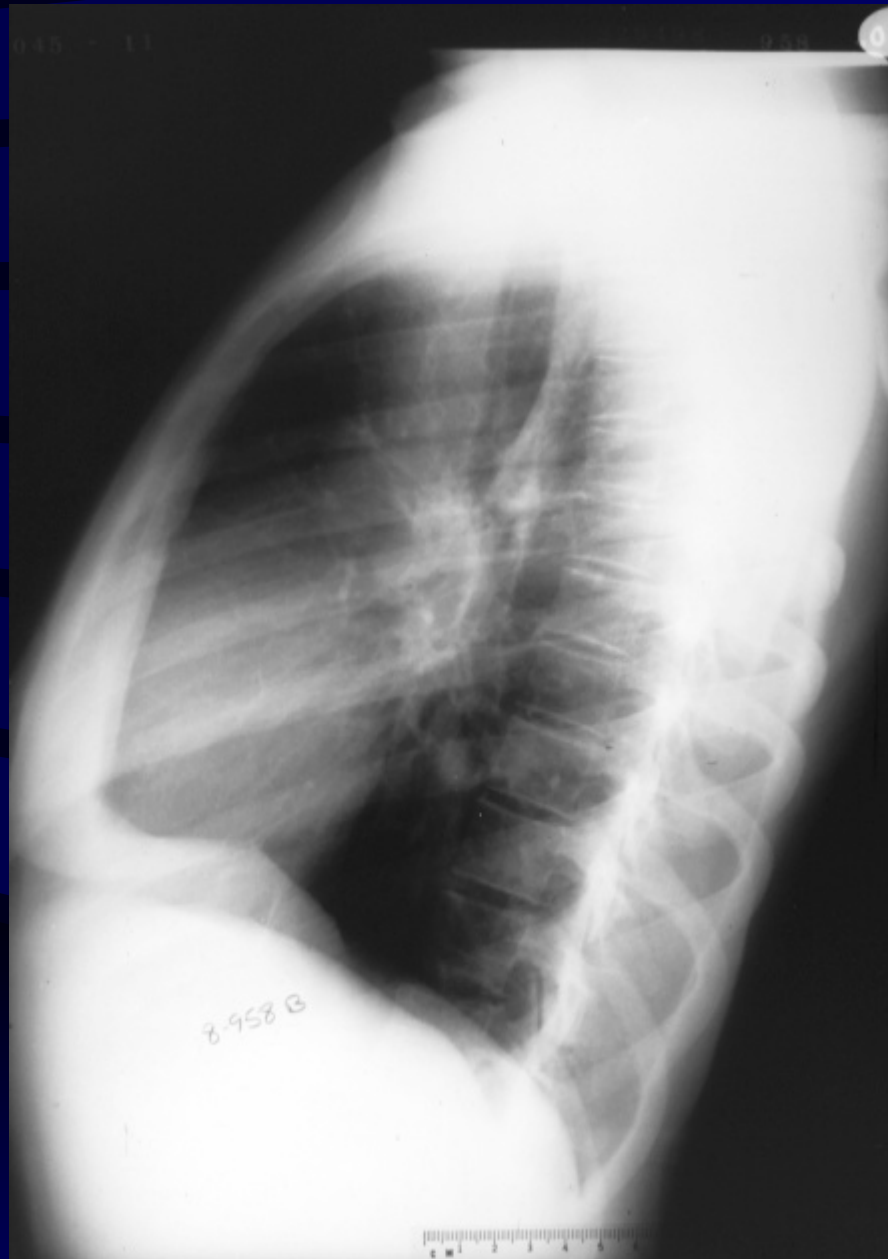
Lateral Airways

- Trachea and Main Bronchi
- Left bronchus on end





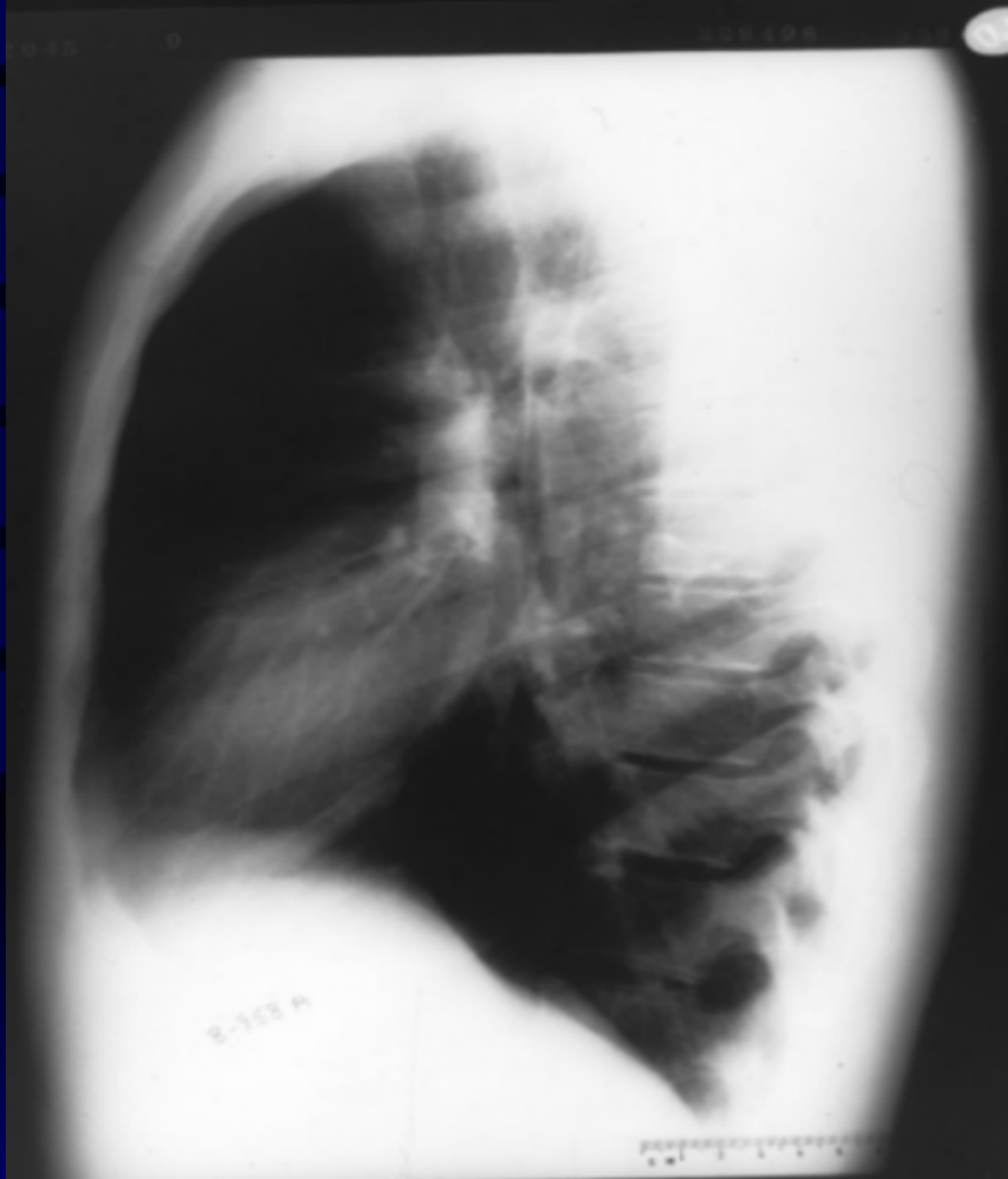


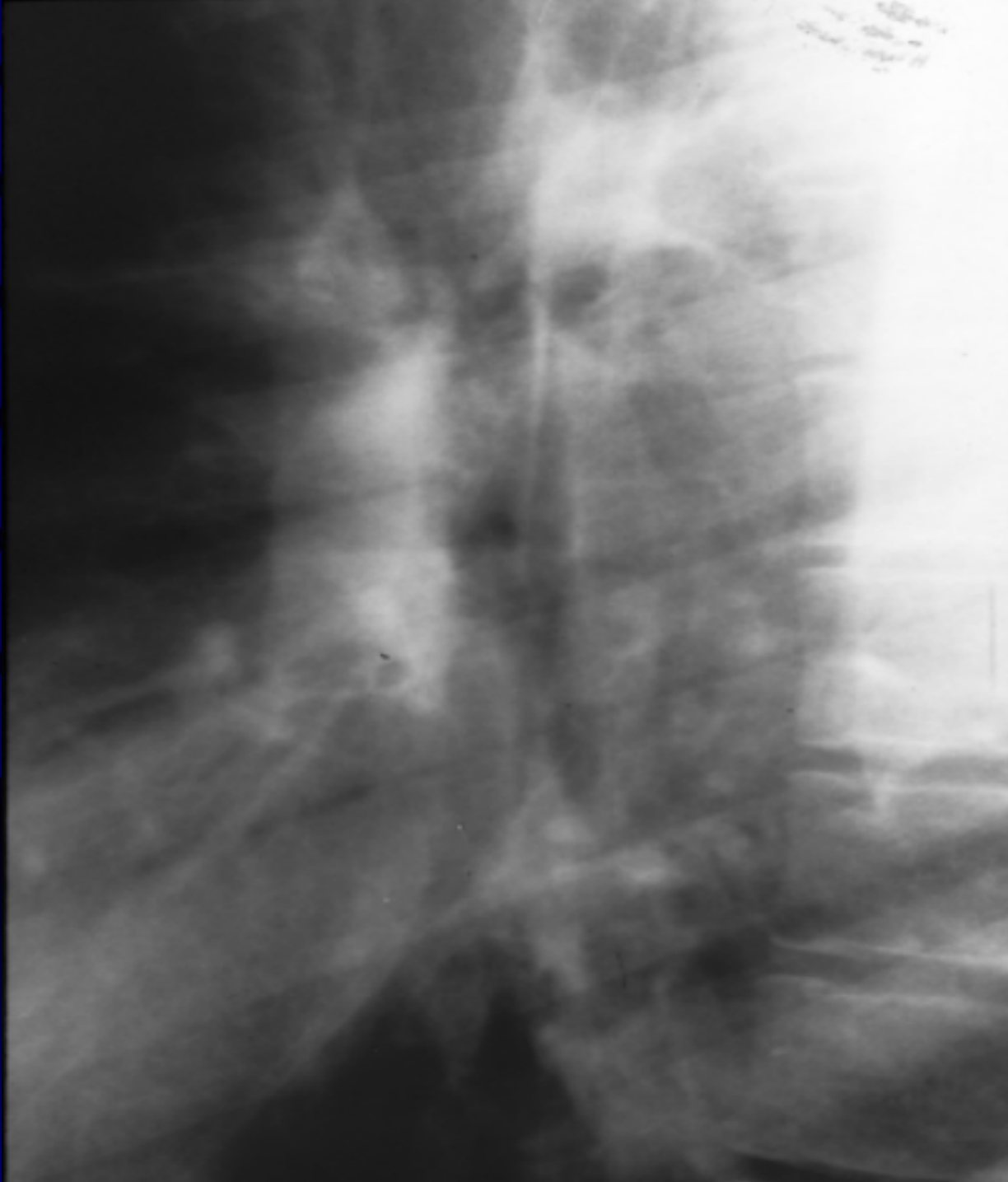


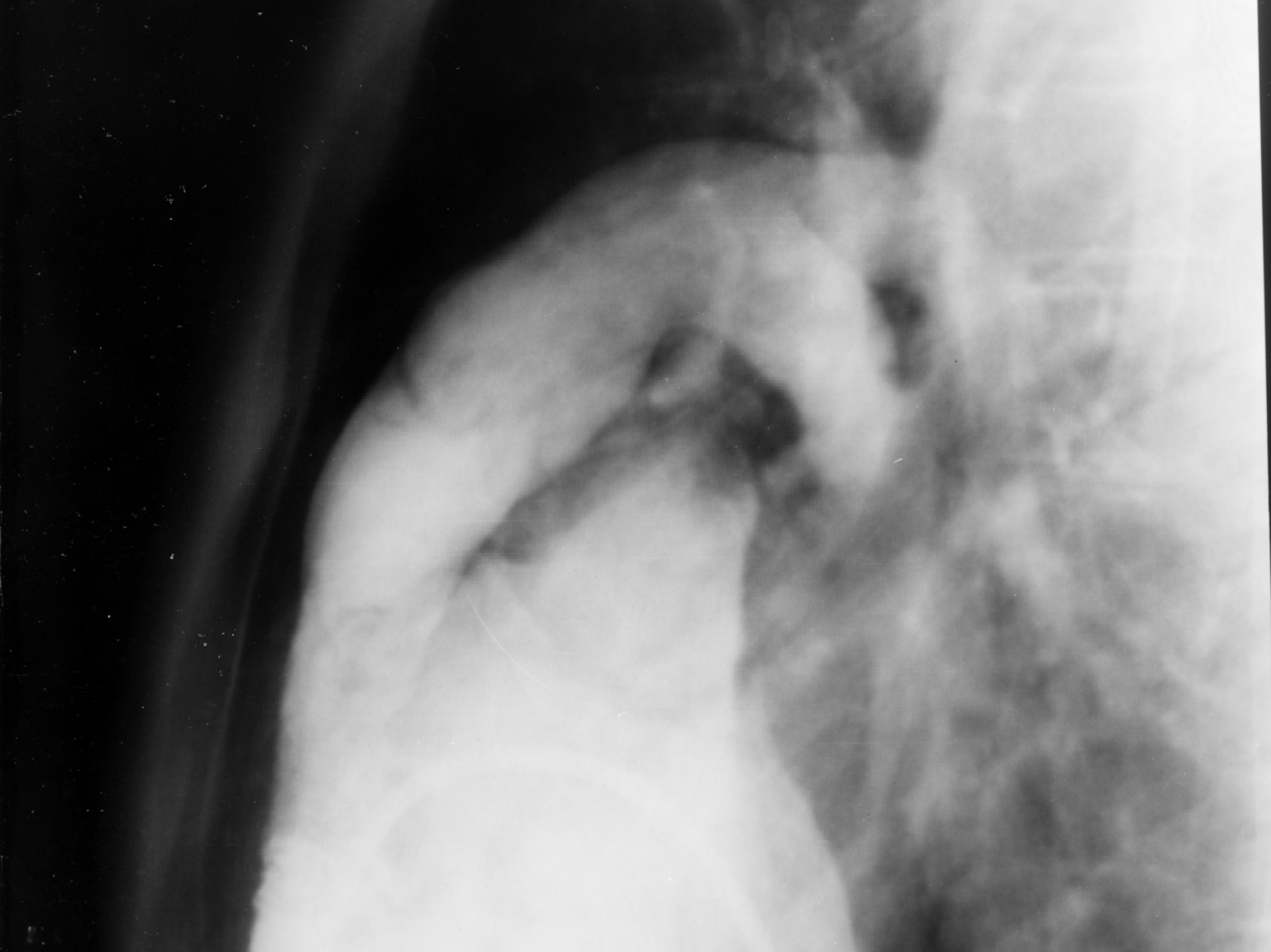


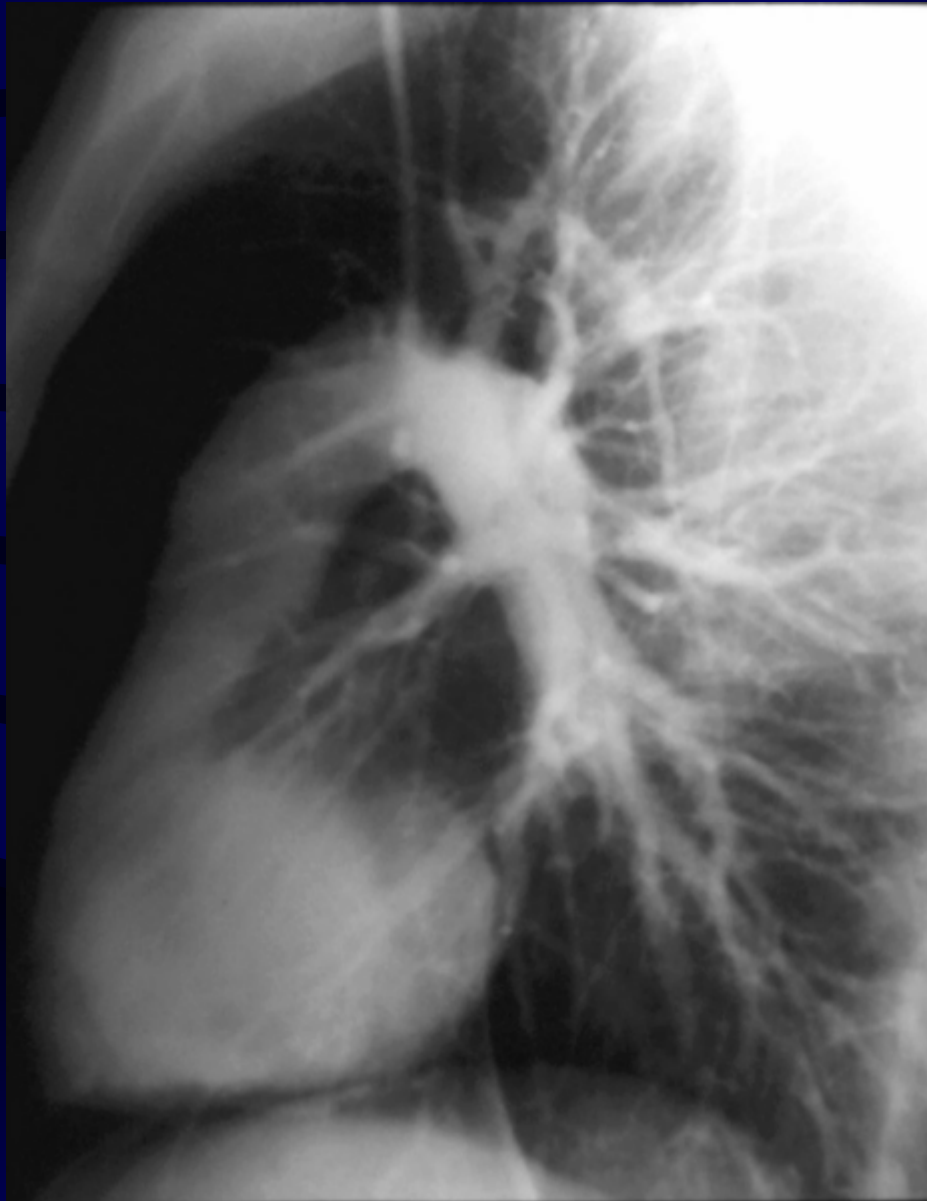
Lateral Hila

- Left and Right Pulmonary Arteries



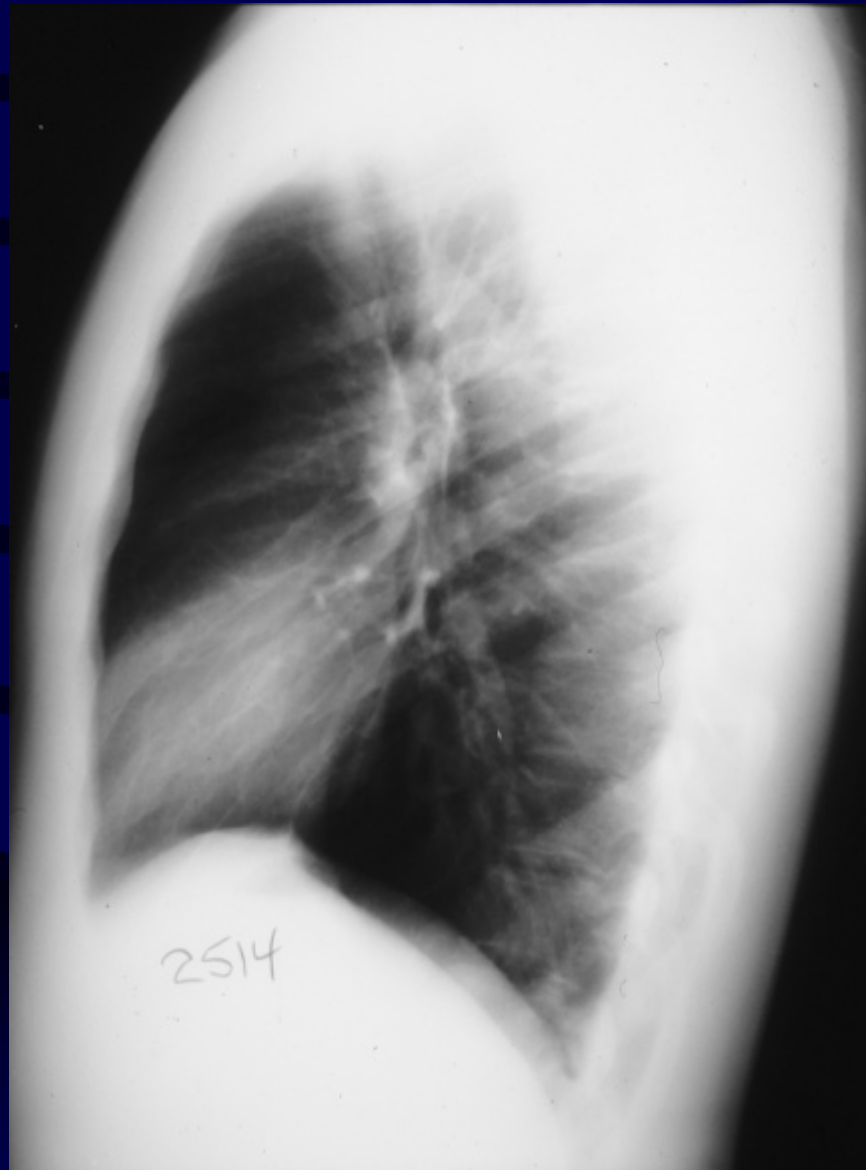


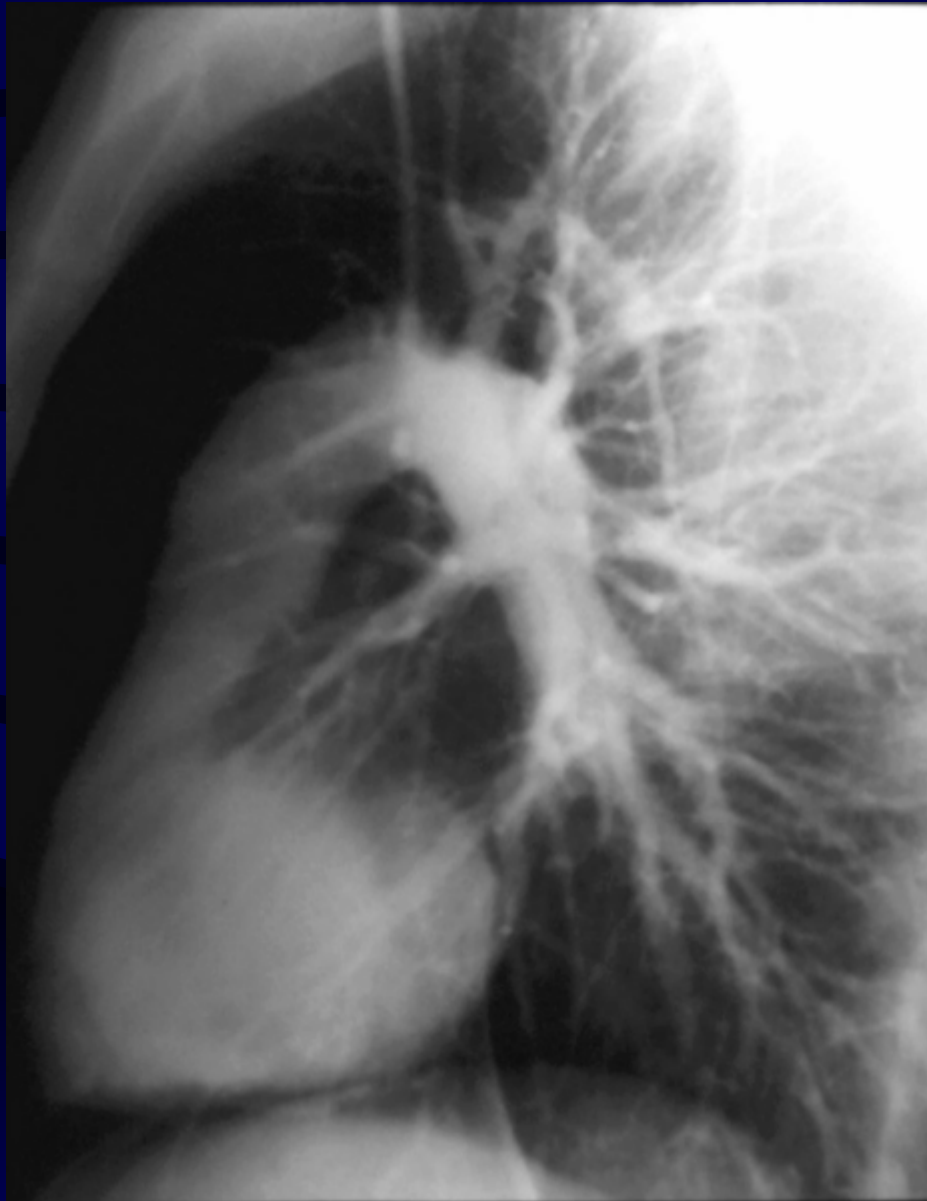




Lateral Lungs

- Markings
- Fissures - Major, Minor









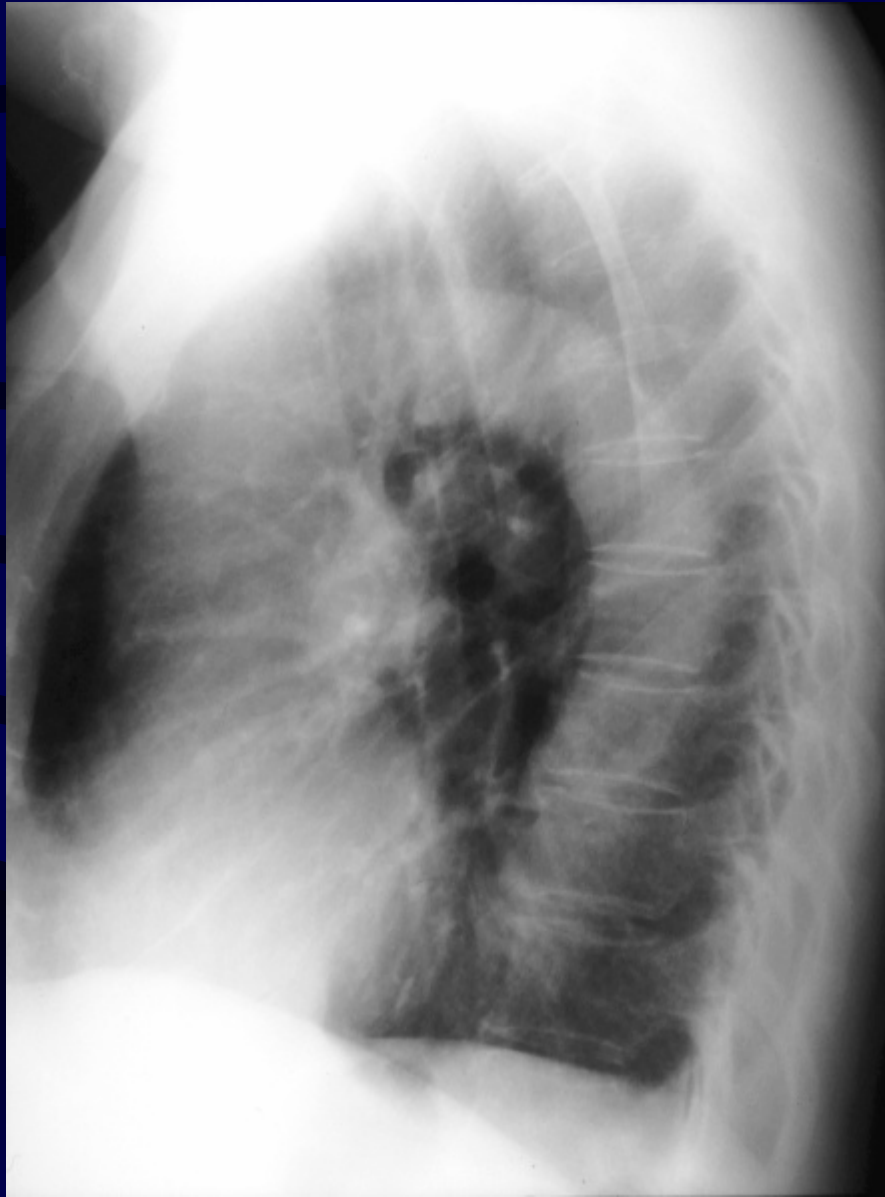


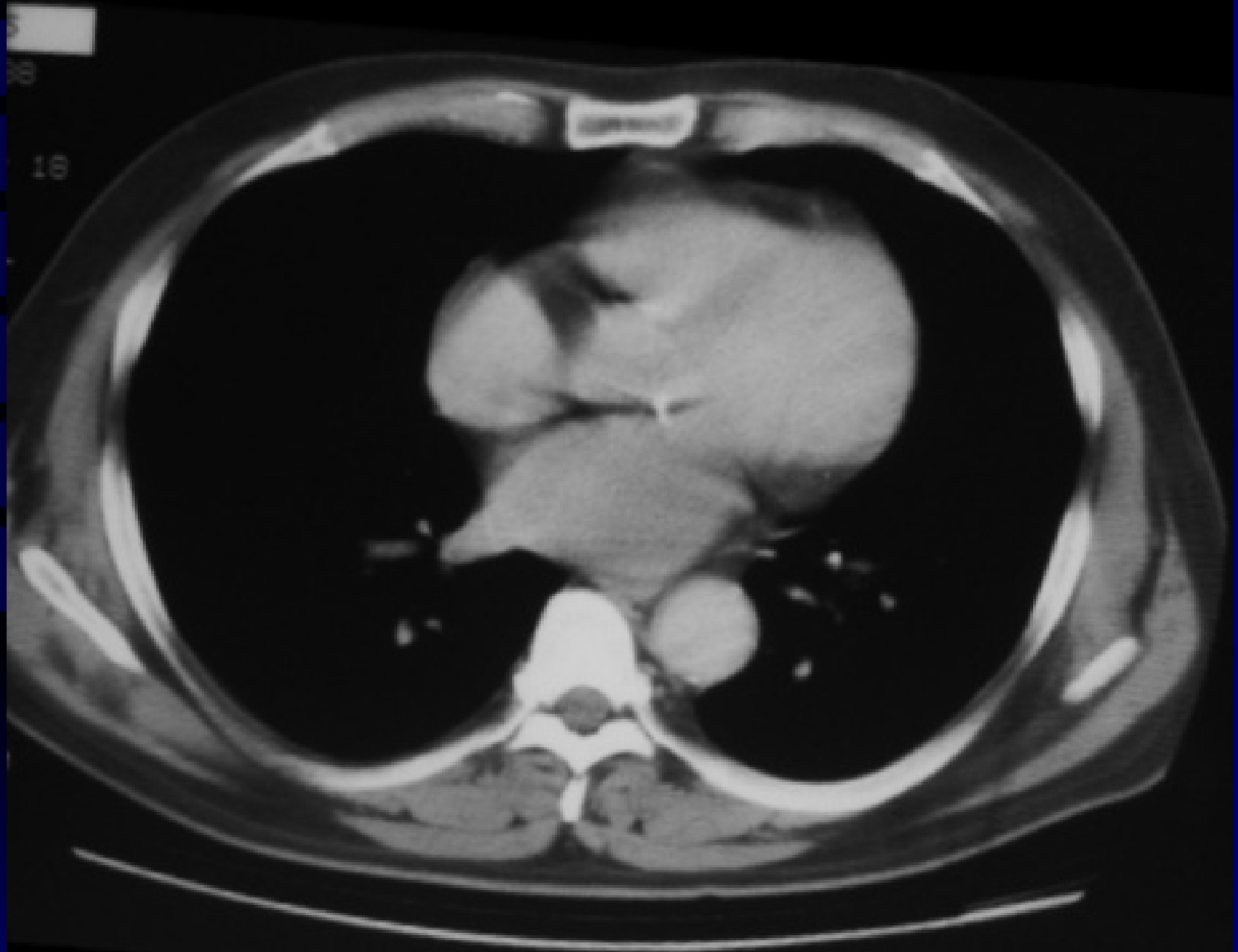
Lateral Heart

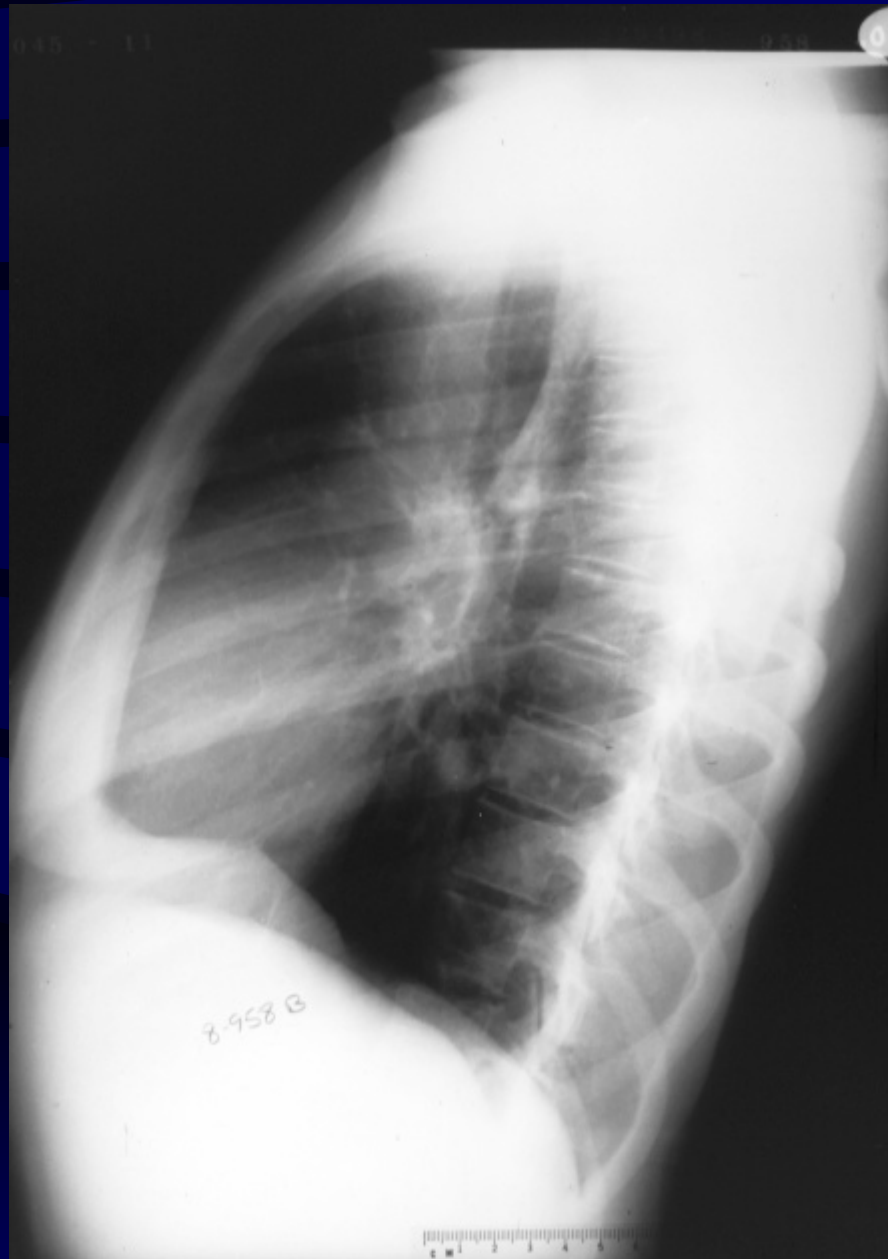
- Left Ventricle













PICKER INTL 12005

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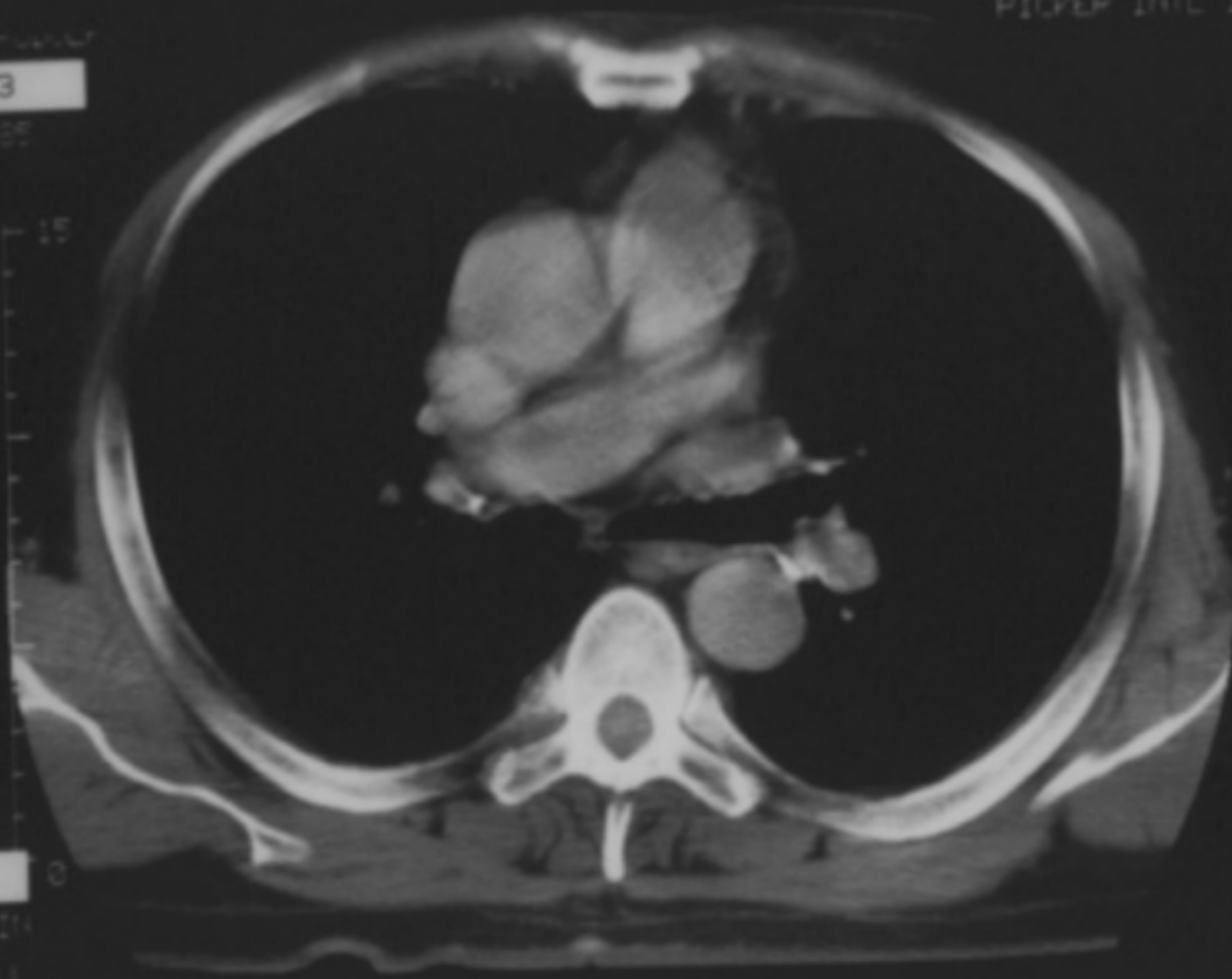
17147

1184 15



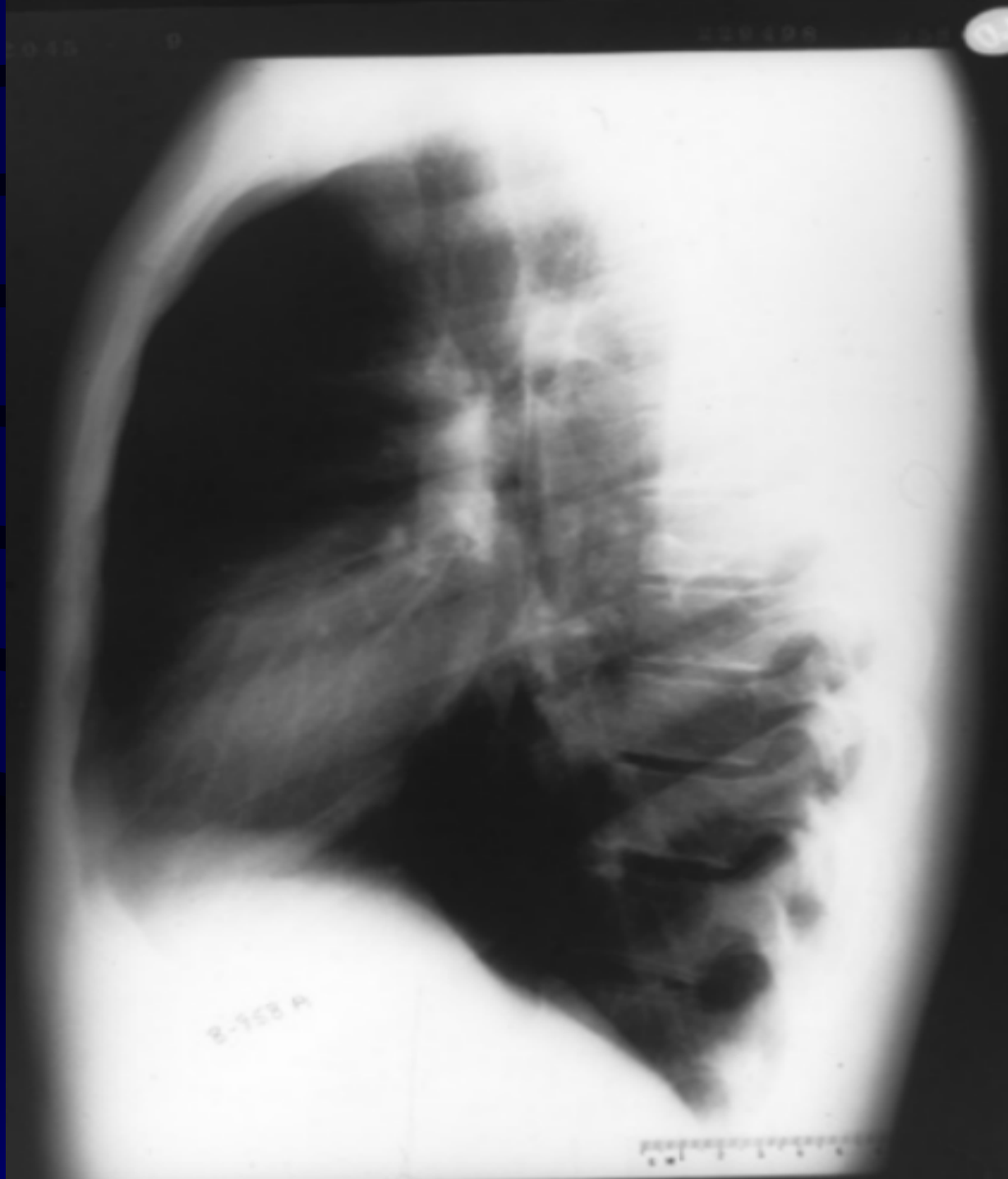
P LIN

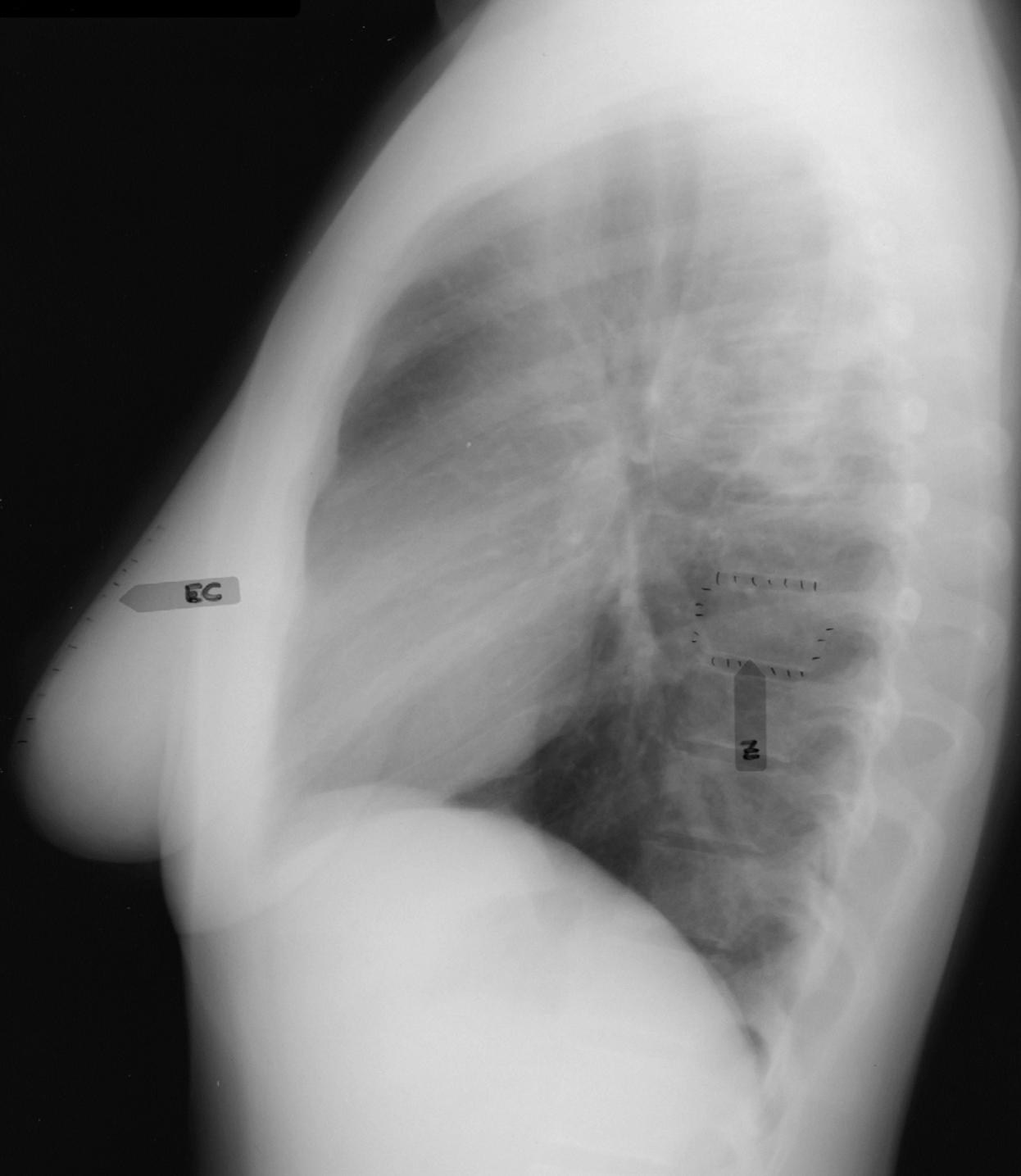
LP FUL



Lateral Posterior Chest

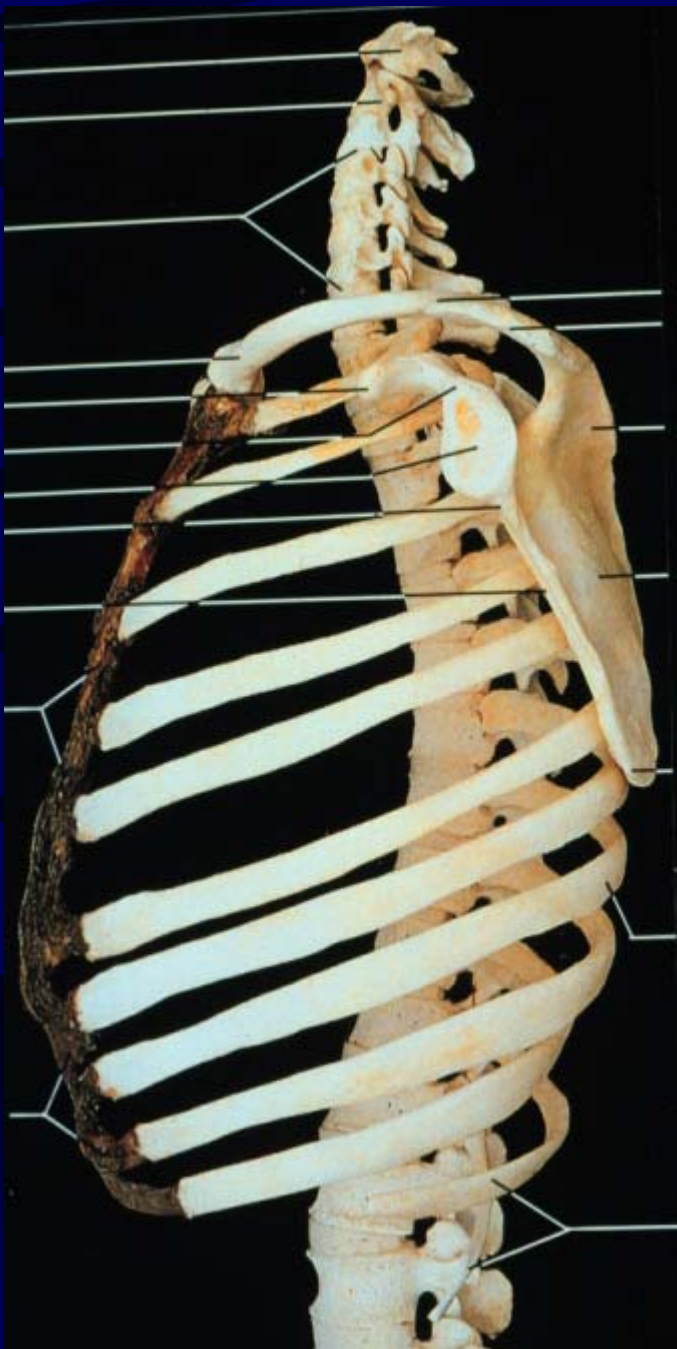
- Spine - Bodies and Disc Spaces
- Ribs





EC

2

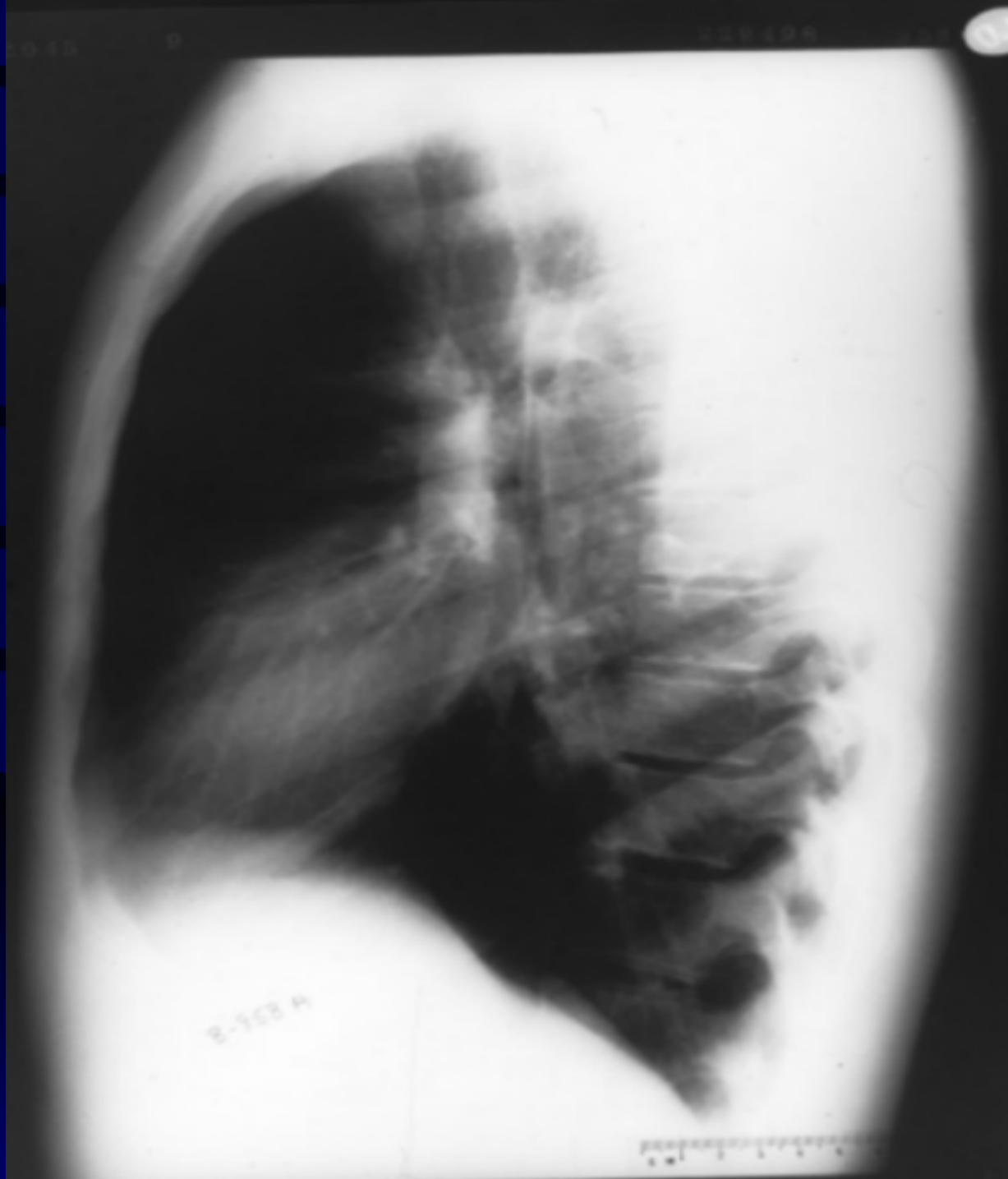


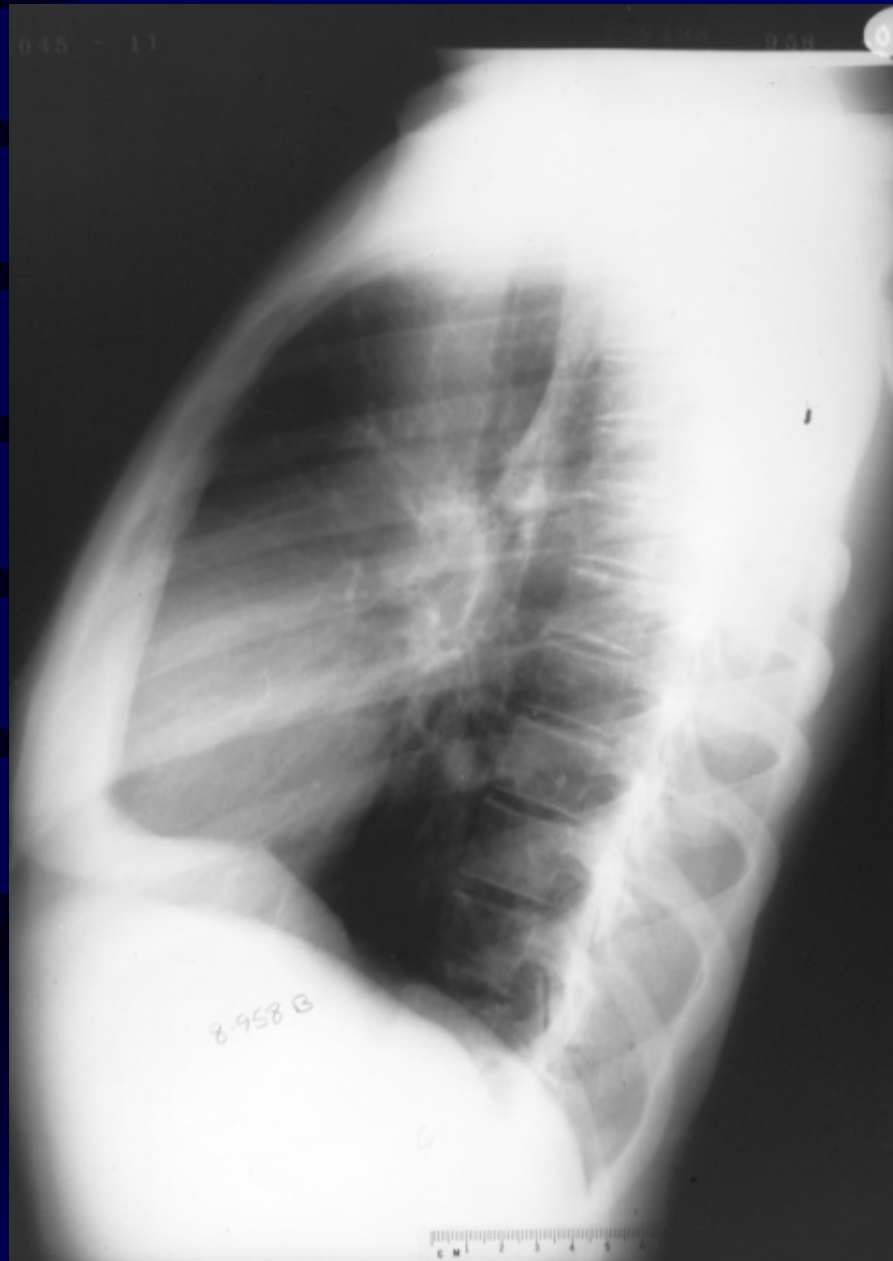


Lateral Diaphragms and Bowel Gas



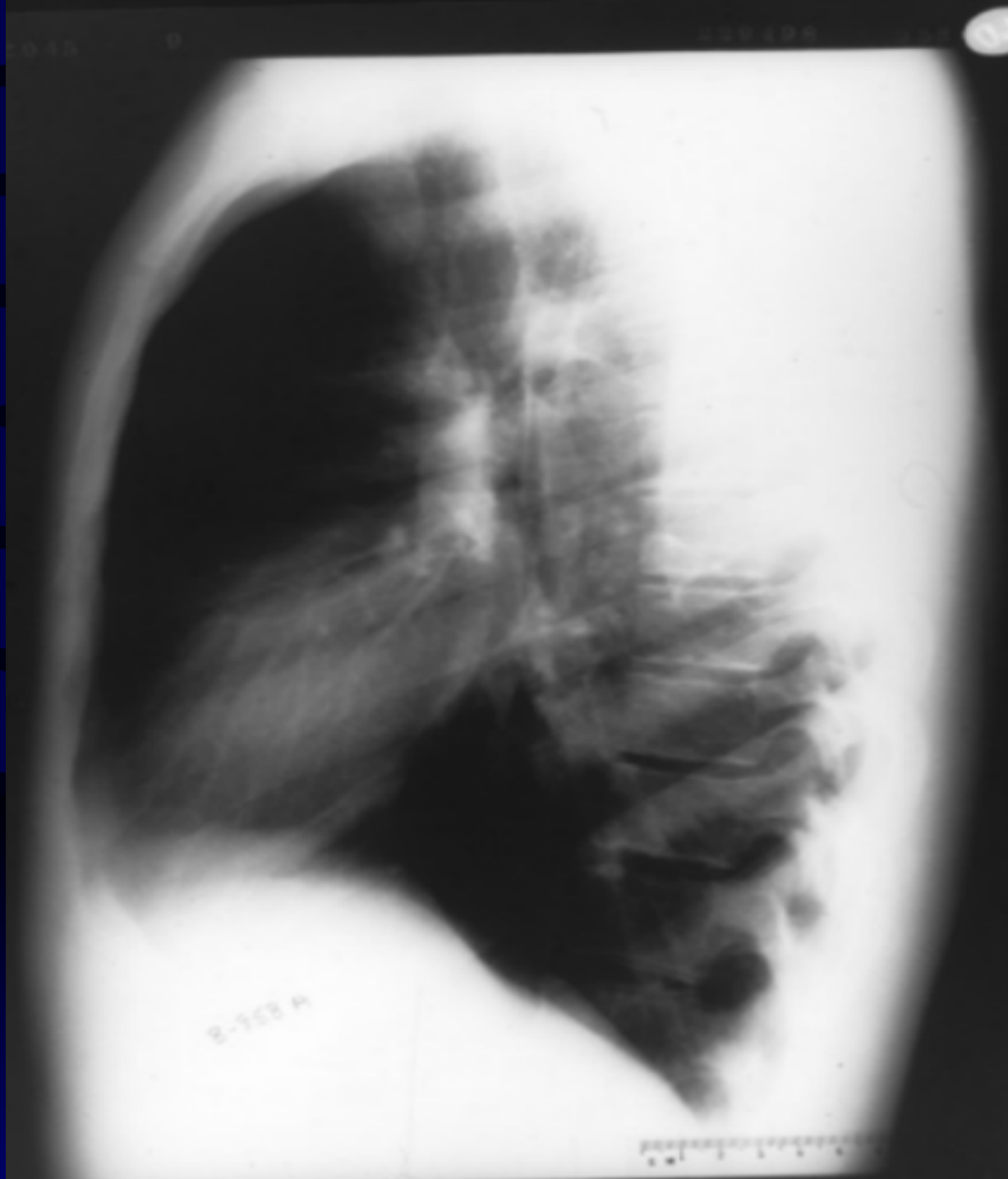
6128



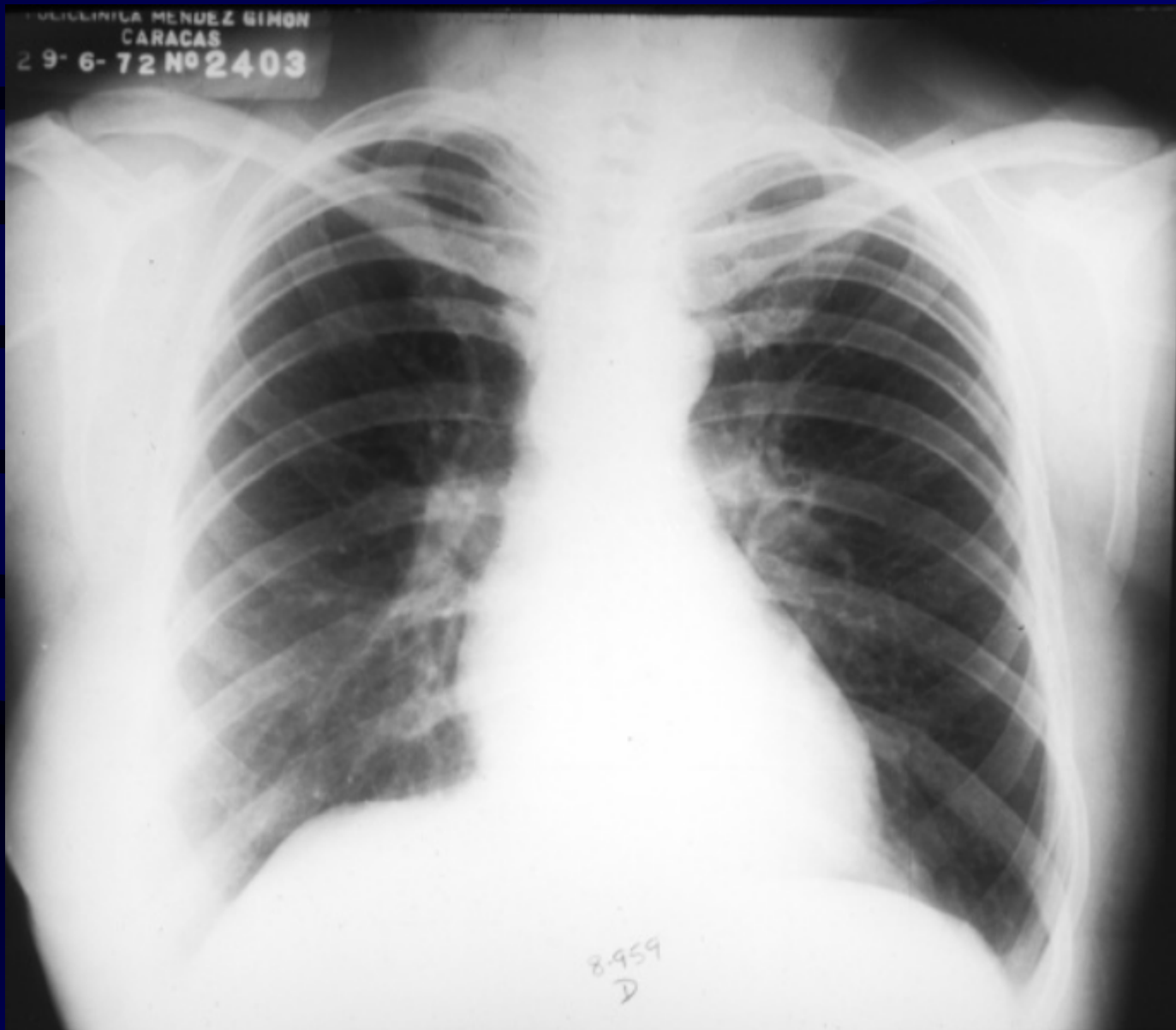


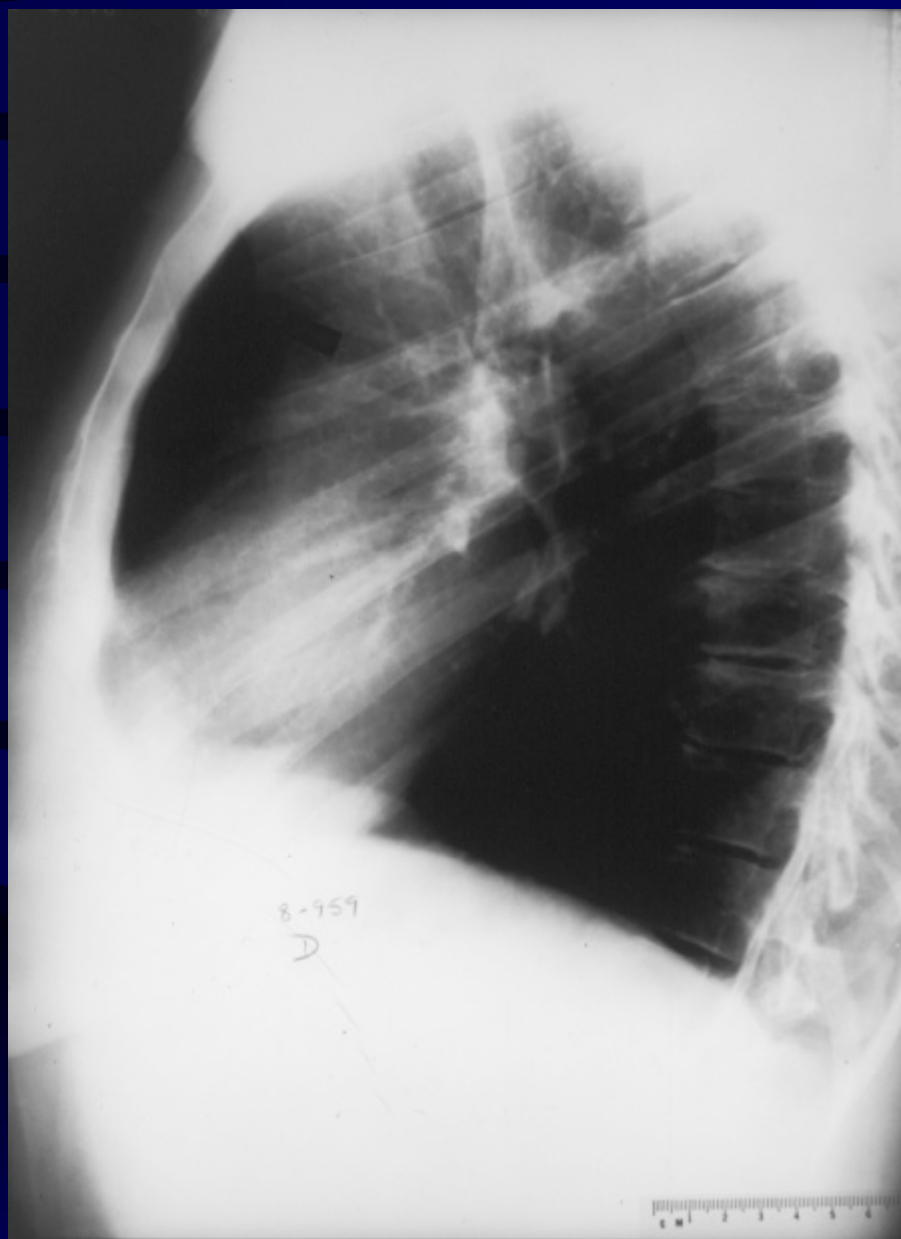
Lateral Anterior Chest

- Chest Wall
- Sternum



FOLIOCLINICA MENDEZ GIMON
CARACAS
29-6-72 Nº 2403









S 54 81



LEFT

18 45 81

18 45 81

18 45 81

18 45 81

18 45 81





4081